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Electrical World

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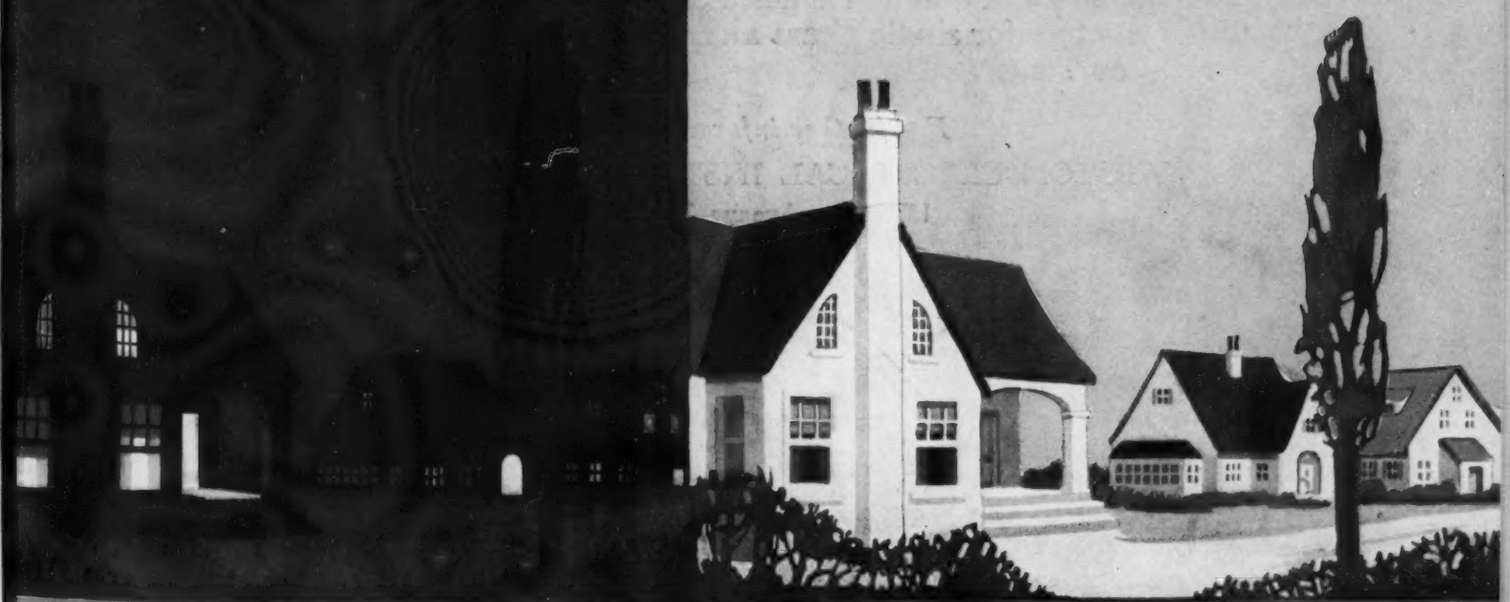

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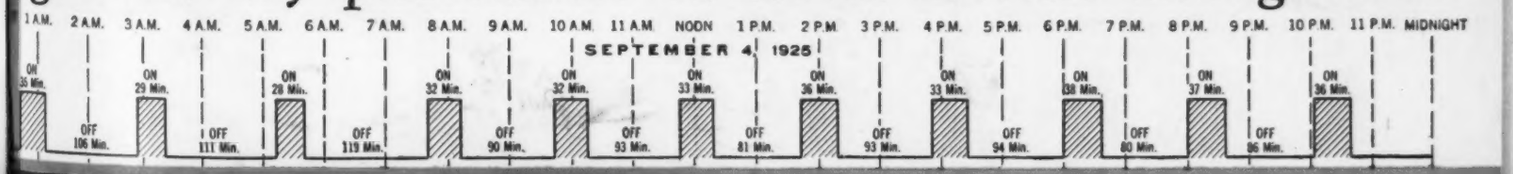
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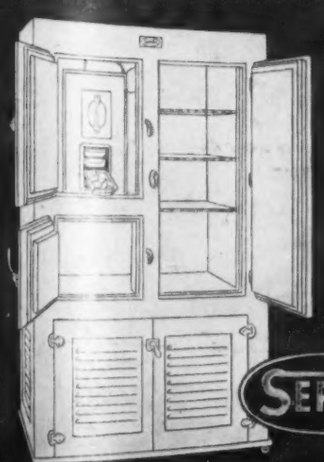

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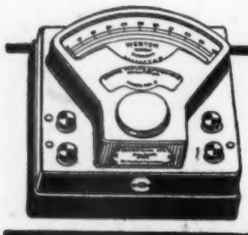

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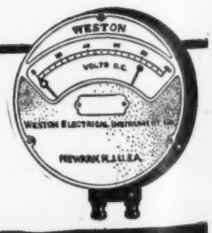

Electrical World

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W. H. ONKEN, JR.
Editor

VOLUME 87 — *New York, Saturday, May 22, 1926* — NUMBER 21

Electrical Industry Congratulated for Its Social Service

AS THE custodians of an outstanding and public necessity of American life, the electric light and power companies of the country are consciously realizing more and more the social significance of electric service. This was very apparent at the convention of the National Electric Light Association held at Atlantic City, N. J., this week. Leaders of thought in national life, as well as "elder statesmen" of the industry itself, repeatedly touched on this aspect of the electric light and power business, and it indicates a widening of vision and a more responsive and enlightened leadership which speaks volumes for the future.

Each recurring annual convention of the N.E.L.A. is usually said to be "the best one we ever had." One can say that of 1926, and give reasons with rather more than usual particularity, because it has been in some respects unique. By the elimination of parallel sessions on all but the first day, attention was focused upon certain broad considerations that are of prime concern to every one in the electric light and power industry, whether major-generals or just captains and lieutenants. This focusing was made effective by the character of the program.

THE contributions and addresses and the composite effect of them were likewise significant. They constituted an authoritative interpretation of the industry by its recognized leaders from one or the other of three major viewpoints—the commercial, the sociological and the economic. The commercial need of aggressive development of new business to keep the industry well balanced and prosperous was stressed by such leaders as Samuel Insull, S. Z. Mitchell, E. W. Lloyd, J. E. Davidson and Guy E. Tripp; the social responsibility, in its relations with customers and with the entire body politic, to keep itself in such a state of financial and political health as will justify its continuance as an outstanding example of individual initiative and private enterprise, by such outstanding men as Owen D. Young, R. H. Ballard, Secretary James J. Davis of the Department of Labor, Secretary Andrew Mellon of the Department of the Treasury, W. E. Creed, William Allen White, William Green, president of the American Federation of Labor, and others, and the economic, by a host of the industry's best engineers and executives, who told of the industry's part in raising the standard of living in the United States to a height unapproached anywhere else on earth.

Practically every item in the four-day program stressed one or the other of these considerations. Generally speaking, the papers and addresses by persons outside of the industry were in corroboration of those that came from within the industry. It was especially gratifying to note that the men who spoke for labor expressed a recognition of power as supplied by the industry, in its effect upon the earning and enjoying capacity of the masses.

EXHIBITS which formed part of the convention and which comprised the finest array of electrical equipment ever assembled under one roof were as interesting as the convention itself. Indeed, they constituted, almost literally, a post-graduate course of one week in equipment development and progress, and indicated the extent to which manufacturers have co-operated with the National Electric Light Association in telling and demonstrating the innumerable advantages of electricity. All in all, the observations of leaders noted elsewhere, laudatory as they are, give but an imperfect impression of this great convention, unprecedented in interests represented, in attendance and scope and in extent of exhibits. The full report appears in this issue and shows that the electric light and power industry is no longer content to devote itself solely to the improvement of power production, but recognizes its civic, social and industrial responsibility to the country for more intensive development and for more intelligent understanding of economical and democratized service.

The Engineer Keeps on Top of His Job

THE engineers have done such a good job in the light and power industry that many utility men take their work for granted. In some degree the impression prevails that the engineering aspects of the industry have been so perfected that only minor problems remain. As a matter of fact, the technical work of the utility engineers is more difficult and greater in quantity than ever before. A survey of the reports presented at the N. E. L. A. convention shows that many major engineering problems await solutions before the industry can progress with the greatest economy. Interconnection of systems, a greater use of transmission, increased density of load on distribution systems, larger power ratings on equipments and a multitude of minor engineering problems in design and operation incidental to the operation of the large central-station systems call for first-class engineering talent.

The service reliability of waterwheels and steam turbines leaves much to the imagination. A transmission line is not yet a structure built to a standard specification and then forgotten. Every phase of the utility business has its technical problems which must be worked upon from an economic as well as a technical basis. Fortunately, the engineers go ahead with their fact finding, their experimentation and their construction without caring or thinking much about publicity or thanks. They are workers who find greatest joy in working. Yet the industry should be grateful to this competent group which accomplishes its work with no fanfare of trumpets. Their success in their tasks largely measures the progress of the industry, and they need and deserve the utmost encouragement and cooperation.

This year the engineers have measured up to a high standard. They are working with a better perspective and are building the industry upon more definite plans. They are anticipating developments before conditions become critical. But in addition to technical progress it is a notably encouraging sign in the industry to find engineers participating more largely in the management, public relations and commercial aspects of the utility business. Their solid thinking and definite approach to problems are certain to aid in building better conditions in the industry.

Accounting Section Praised for Excellent Work

FAVORABLE comment on the work and the program of the Accounting Section was heard on every hand at the N. E. L. A. convention. The section program was of unusual caliber and breadth, for it consisted of addresses on vital and broad industry topics by men of established reputation and standing. The reports this year were good, and the general development of the section's work was very encouraging to the industry.

It is time for the accountant to come into his own in the light and power industry. Business should be built on facts. Too long has the industry progressed on the basis of opinion and guesswork. A knowledge of costs and returns and complete records of the ramifications of the utility business are essential for its successful conduct. The accountants are measuring up to their opportunities and to the business necessities. They are approaching their problems with a broad perspective and an intimate knowledge of the needs of executives. A study of the report of the statistical methods committee should be made by all men in the industry, for it represents work started which has great possibilities ahead.

The accounting reports and the splendid program carried out at Atlantic City have earned the hearty approval of the whole industry. No group could focus its attention upon large affairs in the electrical field with more effectiveness.

Well-Merited Award Goes to Chicago

THIS year's award of the Coffin prize to the Commonwealth Edison Company of Chicago is well deserved. Few utilities have a more commendable and consistent record of promise and performance. Its five major generating stations are among the largest and most efficient in the world, and the company's output of electricity exceeds that of any other generating system using steam as a motive power.

Under the personal and sagacious leadership of Samuel Insull, the Commonwealth Edison Company has always occupied a position of prominence and leadership in the electric light and power industry. His driving force and vision have been an inspiration not only to his own very loyal organization, but to others within and without the business, so that the name of Insull stands high up among the names of America's captains of industry. Nor is his reputation one whit less in England and on the Continent of Europe.

For service to the community the Commonwealth Edison Company stands pre-eminent. The Illinois Commerce Commission rates it as the best in the state, and no company generating exclusively from steam sells more electricity per capita. Last year more than 23 per cent additional load was connected to the circuits of the company, the average consumption per residence was brought up close to 500 kw.-hr., and the per capita use in Chicago increased to 920 kw.-hr. Approximately $4,000,000 of electrical merchandise was sold over the counters of its electric shops.

Aggressiveness has always been one of the outstanding characteristics of the Commonwealth Edison Company, Mr. Insull's aim having always been to supply all the electricity used for any purpose in Chicago. For that reason there are few isolated plants in the territory served by the company; the transportation systems derive their energy from the lighting companies' circuits, and now the Illinois Central Railroad Company has contracted with the company for all the electricity it will require in its electrification.

From a strictly engineering angle, the Commonwealth Edison Company has ever been a pacemaker. To secure greater reliability its high-tension transmission system has been rearranged, and a 132,000-volt superpower tie-in ring between contiguous generating systems in Illinois, Indiana and Wisconsin has been worked out, with Chicago as its hub, in the interest of all the communities and companies concerned. Thus all the resources of the various companies may be pooled, the base load of the interconnected region carried on the most efficient equipment of the combined companies, and the less efficient equipment held in reserve. The ar-

rangement is as broad as its conception and is one of the many economic movements taken by the industry to expand its service with profit to the user and to the enhancement of public relations.

But why narrate further? The Commonwealth Edison Company is recognized as one of the industry's best utility companies, and Samuel Insull is everywhere acclaimed as the most outstanding advocate of electric light and power service. The Coffin prize committee did well in making an enduring acknowledgment of these facts.

Death of Carl Hering

THE sudden death, totally unexpected, of Dr. Carl Hering, electrical engineer and inventor, one-time president of the American Institute of Electrical Engineers and of the American Electrochemical Society, has taken away one more outstanding figure in the group of men who created the electrical industry in America a generation ago. At the request of the ELECTRICAL WORLD, B. A. Behrend of Boston, a close friend of Doctor Hering's, contributes the following editorial tribute to his memory:

"This is an impersonal age. The rapid increase in human numbers, the geometric rate of progression frequently styled or misstyled 'progress,' leaves only the flood of quantities, be they motors or automobiles or other mass production, in its chaotic tracks. So many events take place every minute that the memory of man is staggered and bewildered. Yet it appears to be the truth that the protagonists of scientific industry are, if not the creators, yet the means through which development takes place.

"Dr. Carl Hering was one of the men who exerted a profound influence on the electrical art of our time. His inventions of electric furnaces and his contributions to electrochemistry are a testimony to the usefulness of his labors. Like his contemporaries in electrical engineering, he was essentially a physicist. He sought scientific physical training, and he told the story of how he wrote as a young man to the founder of the Siemens & Halske Company, Dr. Werner von Siemens, asking his advice where to obtain fundamental knowledge of electricity. Doctor von Siemens replied in a long letter suggesting the electrochemical laboratory of Doctor Kittler at Darmstadt, to which the young American student repaired. The fascination of theoretical work never forsook Doctor Hering, as is indicated by an extensive correspondence with the writer of this editorial.

"The courtesy of Dr. Werner von Siemens, then a very great and important man, extended to this unknown young American, shaped doctor Hering's life. He, in turn, tried to aid others, young and unknown, in a similar manner. There are many whom he has thus assisted. These notes would indeed fail to do justice to Doctor Hering were they not to refer to his untiring devotion to his friends. Among them was the late but unforgettable William D. Weaver, with whom he was at the latter's death. During the writer's grave recent illness Doctor Hering came twice a long distance to cheer and encourage.

"The worth and value of a man's imprint on our art is gaged by the quality of his work and by his personality. The writer of this editorial had shared for three decades the friendship of Doctor Hering and had exchanged opinions with him on the subjects on which he worked. Testimony to his gentleness, courtesy and consideration, profound sportsmanlike interest in all subjects pertaining to the field of electricity, must be rendered by all who knew him intimately. 'Earth would never touch her worst were one in fifty such as he!' "

Commercial Men Challenged

THE commercial men in the light and power industry have been challenged by their leaders and their executives. At the convention was presented a brilliant series of addresses on commercial possibilities. Data and opinion were given to show what is needed to do the job required of the commercial men. They were made acquainted with their opportunities and were challenged to show competency.

Let them take advantage of the executive hearing afforded them and the executive support promised to a sales plan and a sales policy. They are invited into the councils of the mighty to aid in industry development. They should accept the challenge with enthusiasm and show their competency by their works.

No fear of censure should be permitted to outweigh a direct and thoughtfully prepared commercial attack on industry problems. The essences needed to bring success are enthusiasm, knowledge, confidence and hard work. If they embark upon their work with the confidence produced by enthusiasm and conviction their success is assured. There is no place for the negative and no chance for vacillation.

The will to win out is the chief factor in every constructive activity. Edison has it. So had every man who has built a business empire—Hill, Carnegie, Gary, Ford. These men did not ask, "What is the matter with it?" They said, "I bet I can make it work." The commercial men in the electrical industry should seize their opportunity in that spirit.

When Obstacles Arise

WHEN endeavor in any given direction does not bring the desired progress, it is not uncommon for those concerned to seek the viewpoint of others in similar occupations; but it takes a broad-minded person to solicit the view of some one "on the other side of the fence," if it is anticipated that the individual consulted may have an opposite view from that of the consultor. None the less, views so derived often enable the unsuccessful person to terminate wrong procedure in solving problems and "start on a new tack" that will be more effective.

Those engaged in the electrical business know what they think of certain problems and of methods of procedure in solving them, so that discussions within the industry may simmer down to the most harmonious agreement; but still the progress desired may not be obtained. In such matters as public relations, electrification of railroads, or any other problem in which persons outside of the electrical industry are involved, why should not the outside point of view be sought? What evidence would have to be given to these men to bring them to share the enthusiastic opinion of the electrical industry? Many fine talks by outside men at Atlantic City gave the key to what the electrical industry must do if its problems are to be successfully and permanently solved.

Newly Elected Officers of the

National Electric Light Association for 1926

1. R. F. Pack
President

2. M. H. Aylesworth
Secretary

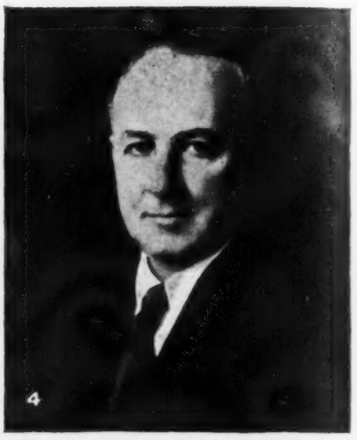
Percy Young
Treasurer

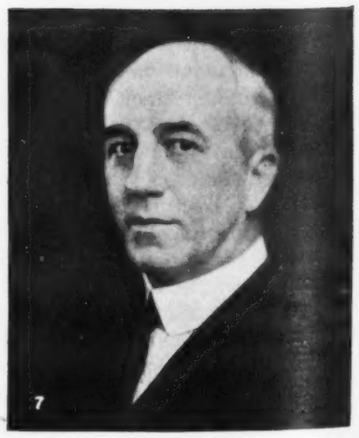
4. J. B. Miller
Vice-President

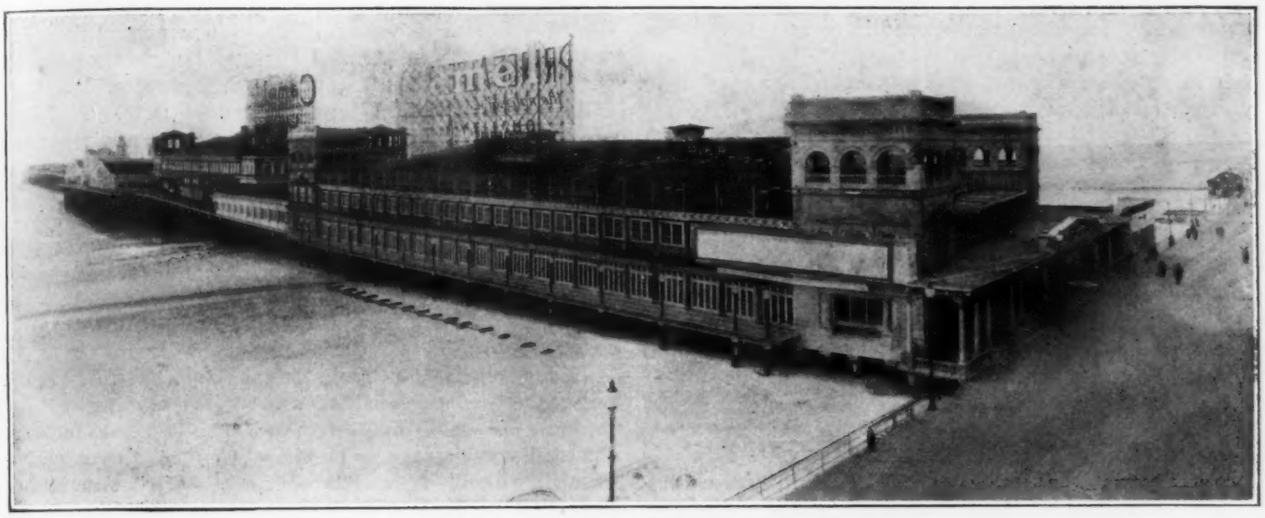
6. H. T. Sands
Vice-President

5. M. S. Sloan
Vice-President

7. P. S. Arkwright
Vice-President







N.E.L.A. CONVENTION HEADQUARTERS, MAY 17-20, 1926

An Industry with a Soul Is Filled with Opportunities

Résumé of N.E.L.A. Convention Gives a Composite View of Great Achievements—Work Well Done Prepares the Way for Greater Advances—Electricity Dedicated to the Cause of Advancing Standards of Living

ELECTRICAL men appeared in full force at the forty-ninth convention of the National Electric Light Association, held at Atlantic City, N. J., from Monday to Friday of this week, and set still higher standards for their industry. To the number of eight thousand they mingled together and attended sessions of unusual excellence. Able addresses, committee reports and conferences were supplemented by enjoyable entertainments and an exhibit of much merit. As stated by Managing Director Aylesworth, each year sees new records established, and this year only lack of exhibit space and the exhaustion of hotel accommodations prevented still larger attendance records and exhibits of unprecedented magnitude.

The following résumé of the convention work and activity is supplemented elsewhere in the issue by full reproductions of notable addresses and condensed and interpreted abstracts of printed committee reports. This survey of the convention presents to the industry many thoughts for consideration and many ideas which can be put to work.

The vanguard arrived on Sunday, and by Monday evening more than five thousand were present to attend the reception of President J. E. Davidson, there to dance and renew their friendships. On Tuesday the business program of the convention opened brilliantly. Well-expressed and thoughtful addresses were delivered to a vast audience which filled the convention hall to capacity. The opening meeting started appropriately with a welcome from Mayor E. L. Bader of Atlantic City, who has the gift of story telling. The presidential address of J. E. Davidson was, in his own words, "not a swan song," but a stirring call to arms, that the industry might continue work of the character which has given it its present enviable position. President Davidson saw no clouds on the horizon and told of the great work done during the past few years. He urged, however, that the industry be militant in the cause of better service.

Treasurer W. A. Jones gave an interim report of N.E.L.A. finances which showed a prosperous condition and gave an indication of the scope and magnitude of the organization's activities. Income from dues amounted to $890,000, and other items built up the sum of $1,325,000. Disbursements as of April 30 amounted to $683,000. This money was spent for running expenses, research, advertising, exhibitions and the hundred and one other activities of the association.

An encouraging report was received from the membership committee. Chairman Howard K. Mohr outlined comprehensive plans to complete the campaign to get a full quota of each class of members in order to have the entire electrical industry fully represented.

CONVENTION OUTGROWS ATLANTIC CITY

The convention is limited in size only by the exhibit and hotel capacity of Atlantic City, Managing Director Aylesworth said in his address. Size, however, should not create overconfidence, he declared, and much remains to be done before the industry can rest on its earned laurels. Growth has been almost spontaneous and increases the responsibility of the industry to render public service. The duty of utilities is to make service available primarily rather than to stimulate

demands for service, and the conditions in this country call for active work.

In Mr. Aylesworth's opinion a good job has been done with power business, and this is evidenced by the industrial and labor conditions in this country. But to maintain a balance and to keep public confidence it is essential that the industry give service to homes in greater measure. Only a 10 per cent job has been done in relieving homes from drudgery. Then again rural service offers great possibilities for industry activity and the co-operative study now under way is of large potential value. Mr. Aylesworth said that national co-operation and a keen sense of public service had made industry progress possible and should continue as fundamentals in the future.

SLOAN STRIKES FOR GOOD PUBLIC RELATIONS

In a vigorous and telling address M. S. Sloan, chairman of the Public Relations National Section, called for executive support and attention to public relations. He asserted that public opinion is now favorable to the industry and that this is true because of vigorous, systematic and efficient work on public relations throughout the country. Results attained give reasons for gratification but not for satisfaction. The public relations problem is not yet solved and present conditions call for still greater and more effective efforts. Public utility information bureaus require executive co-operation to become most effective, Mr. Sloan said, and their quiet, continued efforts are of the greatest value. He told of the splendid work done by the nine committees and complimented the women's committee especially.

Briefly but comprehensively Mr. Sloan told of the public relations activities of the year. Rural electrification advertising had been very effective. Over nine million sets of messages to customers were sold and eight hundred and fifty thousand sets of messages to stockholders were used. A new edition of the book on political ownership of utilities was issued and widely circulated. The speakers' handbook is ready and a booklet for children has been prepared. Co-operative public utility advertising work was carried on successfully during the year. In an eloquent and forceful manner Mr. Sloan pleaded for greater recognition of the work of the public utility information bureaus, calling it fundamental and most important. A dollar spent in public relations work is an investment in public confidence and understanding and an insurance against menaces that may arise. Promotion of good public relations especially deserves and needs executive attention, he repeated, for this work progresses less rapidly than other developments in the electrical industry have done.

YOUNG GIVES HIS VIEWS

In a scholarly and thoughtful address Owen D. Young presented his personal views on outstanding utility topics. He said that, after all, public relations was the utility anchorage as public service was the objective of utility ambitions. His observations led him to believe that utility managers know too much about their business and the public too little. There is too wide a separation in knowledge. When customers buy stock in a utility the utility executive should take stock in public welfare. He must be a non-partisan citizen as well as an operator if he is to gain public confidence. Education is needful for the utilities and for their customers in fundamental principles such as the public good, safety to investors and public service. Partisanship of a selfish character is out of place in the modern world, and education is the greatest eradicator of false opinions and prejudices.

W. H. BLOOD, JR., F. H. GALE AND GERARD SWOPE

MISS ELIZABETH LEE AND M. S. SLOAN

THE N. E. L. A.'S TWO FIELDS

Holding that the National Electric Light Association has two distinct fields, the first as the voice of the electrical industry and the second as an agency for the advance of the electrical art, R. H. Ballard, who made an address on the functions of the association, said that it is difficult to say which of these two fields is the more important. Each depends upon the other. As the voice of the industry, the N.E.L.A. should add to the common good by contributions of sound economics, wise policies and correct vision. It was his opinion that the public policies activities of the association included

IRVING E. MOULTROP

CYRUS BARNES

MARTIN J. INSULL

THOMAS N. M'CARTER

the important task of informing the public of the pitfalls into which political and economic heresies may entice it.

The concluding report of the meeting was by W. C. L. Eglin, chairman of the committee on constitution and bylaws, who announced a proposal for changing the name of the Technical National Section to Engineering National Section.

National Section Meetings

Accountants Hear Excellent Addresses on Broad Topics—Technical Men Present Many Noteworthy Reports—Commercial Session Atmosphere Invigorating—Women's Work a Feature of Public Relations Sessions

TUESDAY afternoon was devoted to the work of the four national sections—Accounting, Commercial, Technical and Public Relations. At each meeting there was a large and enthusiastic audience. The meetings were opened by the section chairmen, who outlined the scope of the year's activities and the progress made, although their formal addresses on the work of their respective sections formed part of the program at the general sessions. The concentration of the respective sectional proceedings in one session each met with general approval.

At three of the sessions—namely, public relations, commercial and technical—the programs consisted largely of reports by the different sub-committees. In conformity with the recent practice of publishing reports in serial form, many of the committees made no printed report at the meeting. Complete abstracts of the printed reports will be found in a separate section starting on page 1139 of this issue.

Many favorable comments were heard in regard to the meeting of the Accounting Section. Notable addresses were given on topics of vital importance to the industry, many of which in no way dealt with the detail or technique of accounting. The broad grasp of industry problems displayed and the enterprise shown by the accountants in bringing leading men before the meeting to speak on vital topics seemed to be greatly appreciated.

FRED H. SMITH

R. H. BALLARD

DUDLEY FARRAND

Steady Technical Progress

J. C. Parker Calls Halt on Unnecessary Standards and Codes—Hydraulic Units Surveyed—Serial Reports Numerous

A FEATURE of the Technical National Section's meeting was the address of John C. Parker on "The Significance of Codes and Standards." The whole philosophy of standardization and its social significance from the standpoint of service to customers was developed admirably by Mr. Parker. He contended that no code or standard on instruction or operating practice should be made unless tradition and well-tried-out experience had established them practically before they were formalized. Another type of code or standard might, in his opinion, be warranted where a small minority willfully and stubbornly impeded progress.

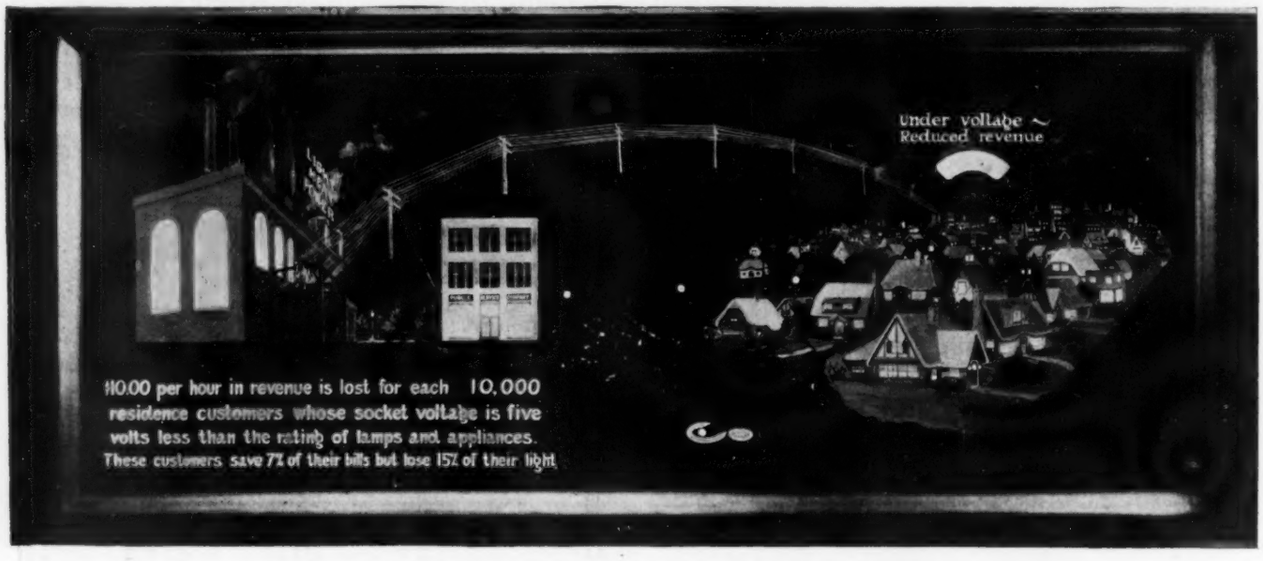
The chairmen of the various technical committees presented reports, and an interesting ceremony was conducted in which Charles B. Scott, chairman of the accident prevention committee, presented the Insull medal for lifesaving to I. P. Crum of the Union Gas & Electric Company, Cincinnati.

E. C. Stone, chairman of the electrical apparatus committee, briefly outlined the scope of this committee's work and emphasized the large number of serial reports produced this year. He said that two major technical developments much to be desired are better high-voltage insulation and equipment of greater capacity for interrupting circuits. The hydraulic power committee produced a notable survey of the service reliability of hydraulic units. The chairman, R. L. Thomas, also called attention to the notable serial reports on the subject of turbine-wheel pitting.

Co-operative work on inductive co-ordination has been proceeding during the year, H. S. Phelps, chairman of the inductive co-ordination committee, reported. Great progress has been made, and there has been quite a betterment in the relationships of the several parties interested vitally in this topic. New problems have been introduced by new types of railroad signaling control equipment and by the popularity of radio broadcasting.

The prime movers committee has published several serial reports this year. A. D. Bailey, the chairman, reported that there have been no radically new developments in the art, but steady and continuous progress is being made on all aspects of power generation and the long-desired day has arrived when a kilowatt-hour can be produced for a pound of coal.

The training of better metermen and the perfection of the meter in practice have been major topics of interest to the meter committee as outlined by A. G. Turnbull, the chairman. The underground system committee told through C. H. Shaw, the chairman, of its work on the high-voltage cable situation during the year. The study of impregnated paper had proceeded very satisfactorily and rapid progress was made in the development and installation of cables for very high voltages.


Under voltage ~
Reduced revenue
$10.00 per hour in revenue is lost for each 10,000 residence customers whose socket voltage is five volts less than the rating of lamps and appliances.
These customers save 7% of their bills but lose 15% of their light

AN ANIMATED CHART SHOWED REVENUES FROM LIGHTING

Utilities Gain in Public Faith

Customer Ownership Adds 236,000 Stockholders—Savings Bank Investments Legalized in Fourteen States—Work of Women

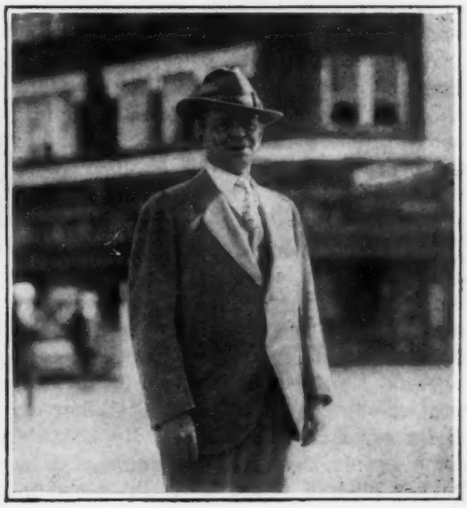
WHEN the Public Relations Section met in the ballroom of the Million-Dollar Pier on Tuesday afternoon a large audience was present to hear the reports of the various committees. M. S. Sloan, chairman of the section, stressed the relationship that should exist between a public utility and its patrons. Brief interim reports were made by the committee on co-operation with educational institutions, the committee on information bureaus and the committees on public relations advertising and information.

In the opinion expressed by the committee on customer ownership, that movement has been the most powerful single factor leading up to the present well-being of the industry. Last year more than 236,000 new stockholders were secured and $297,000,000 was raised through customer-ownership companies. Since 1914 1,183,410 shareholders and more than one billion dollars have been obtained.

The manufacturers' advertising committee reported that the sum total this year of national advertising by the manufacturers in the interest of the electric light and power industry has been double the amount of last year, which was a record year.

L. S. STORRS

E. A. BARNES AND W. W. FREEMAN



FRANK S. CLARK

The committee on public speaking reported that its efforts had met with no little success. During the year at least 10,000 talks were made on some phase of the public utility business to audiences aggregating one and a half million people.

WOMEN MAKE PROGRESS

The women's committee was shown to be making greater strides than ever. During the year it has developed a large number of worth-while speakers. It asked of executives and officials deeper understanding, a sympathetic attitude and fuller co-operation.

Further studies on employment, compensation and pensions were made by the industrial relations committee in addition to consideration given the subject of health. These topics were treated at length in the report of the committee.

In the first four months of this year insurance companies, savings, national and state banks and trust companies invested more than $427,000,000 in electric utility bonds and in the same period more than $68,000,000 of electric utility securities have been sold to the public, aside from many millions bought locally through customer-ownership plans. These figures were presented by the committee on the relations with financial institutions. From June 1, 1925, to May 1, 1926, said the report, the issues were bonds totaling $677,000,000, notes aggregating $62,000,000 and stock totaling $240,000,000, a grand total of $979,000,000, or $90,000,000 a month. Fourteen states have adopted laws permitting investment of savings banks and trust funds in public utility securities.

LEFT TO RIGHT: L. S. COLBY, MRS. R. W. ROLLINS, R. W. ROLLINS AND FRANK H. GOLDING

Accountants' Fruitful Meeting

Notable Addresses on Finance, Holding Companies, Legal Problems and Taxation, with One-Minute Reports

THE Accounting Section and its chairman, C. M. Breitinger, were especially congratulated on the comprehensive and admirable addresses that were presented at the meeting Tuesday afternoon. The chairman declared, in opening the session, that the future is wide open for the Accounting Section. The past year had been a very successful one, but this was possible only because of the foundation that had been laid down by former committees. The various chairmen of committees then gave one-minute reports of their committee activities.

"Federal Taxation" was the subject of an excellent address by R. H. Montgomery of Lybrand, Ross Brothers & Montgomery, New York. He emphasized the point that taxation is an all-the-year matter job and should not be considered at intervals of three, four or five months. He considered interest-bearing securities and how federal taxation affects them, and then dealt at length on the applying of refunds under taxation laws.

C. W. Kellogg, president Engineers' Public Service Company, New York, spoke on "Conservation of Fixed Capital." Saying that if capital is to be raised, it must be conserved, Mr. Kellogg paid special attention to theory and practice regarding depreciation accounts.

That the stanch capability and increasing profits of the electric light and power industry have developed among bankers an attitude of complete comradeship with the industry was emphasized in the next address by R. E. Norton, W. H. Newbold Sons & Company of Philadelphia, who spoke on the topic. "The Bankers' Viewpoint of Electric Utilities." He stated that the increased investment in public utilities securities was due to the spreading recognition of the earning power of these properties. This was the direct result of development, betterment of service, consolidation and

interconnection. These circumstances force the conservative investor's attention to this class of security.

At this time Alex Dow, president Detroit Edison Company, was called upon to give an informal talk, and his humorous and serious reminiscences amused and interested his hearers and did much to diversify the proceedings.

An excellent treatise on holding companies was presented by T. J. Grayson, director of evening schools, University of Pennsylvania. In his opinion, there were two types of holding companies, one good and one bad. He thought that some holding companies were reaching a fork in the road, the right turn leading to success and the left to financial ruin.

"The Electric Utilities' Legal Problems" was the subject of an address by R. J. Baker, of Hause, Evans & Baker, Harrisburg, Pa. He considered the utility company strictly from the angle of a lawyer, and as a lawyer he had found he could get detailed data from electric utilities that it was impossible to get from other utilities. It is on such data, he said, that all rate cases must be decided.

The last address, on "Retirement Accounting Versus Depreciation," was made by L. R. Nash, vice-president Stone & Webster, and, like the others, was a contribution of permanent value to the accountants and the industry.

Commercial Men for More Load

Talks on Competitive Power, Industrial Heating, Load Factor and Electric Trucking Draw Large Audiences

BUSINESS development along sound economic lines was the keynote of the Commercial Section Tuesday afternoon, when an enthusiastic picture was drawn before a large and appreciative audience of the industrial market for the sale of central-station energy. Chairman E. W. Lloyd opened the meeting by telling his hearers of post-war progress in the provision of plant capacity, which has now reached a point where load development should proceed along more selective lines than formerly. He warned the industry against complacency arising from great size and urged the closest study of rates designed to encourage residential uses of electricity. The co-ordination of sales efforts and advertising among utilities and appliance manufacturers was highly commended, as was the issuance of serial reports during the year by sectional committee organizations.

V. M. F. Tallman, chairman of the power committee, then called upon H. W. Derry, chairman of the competitive power sub-committee, to report upon the work of data compilation to assist central-station companies in obtaining and holding business, especially in meeting the competition of Diesel-oil and uniflow engines. Mr. Derry exhibited a large portfolio of data which it is planned to make available to member companies within the next few weeks, and it was announced that the committee will act as a clearing house for the country and will be glad to receive economic data from specific cases for the good of the industry.

A "high-spot" survey of the industrial electric heating market and of the vital importance of training central-station men to develop it was given by W. H. Sammis, chairman of the sub-committee on industrial heating. The speaker reviewed the growth of electric heating business to the present estimated total of 1,200,000 kw. connected load in the United States, yielding an average revenue of $50 per kilowatt to the light and power companies. Turning to educational work in this field, Mr. Sammis declared that the advance of heating practice has been and is so rapid that textbooks are out of date as soon as they can be published, and so the electrical manufacturers and the utilities have taken upon themselves the main burden of supplying intensive training. This year's school will be at the Mansfield (Ohio) works of the Westinghouse company, June 14-26. Within the year there have been six geographic round-table discussions in various cities and a total of 349 men to receive instruction. Fourteen serial reports were prepared during the year on the theory and practice of various heating applications and many more are in prospect.

W. C. L. EGLIN AND E. A. BARNES

Closing the power committee discussion, Chairman Tallman paid a tribute to the pre-convention (May 8) issue of the ELECTRICAL WORLD for its analyses and forecasts of the electrical market and for its general work in the field of load building. He made a strong plea for providing the necessary man power with adequate training to build the heating and other profitable loads lying at the door of the industry.

LOAD-FACTOR IMPROVEMENT

A thorough investigation of the prospects for load-factor betterment was advocated by the load-factor committee, whose chairman was R. H. Tillman. Discussion touched on the possibilities of interchanging power with industrial plants and called attention to the desirability of the domestic refrigerating load from the load-factor viewpoint.

The last address of the afternoon was by A. G. McKeever, president Ajax Trucking Company, New York, who was presented by Chairman B. J. Martin of the transportation committee. The speaker briefly reviewed his experience with electric trucks and discussed their advantages for the short-haul urban field.

The reports of the commercial cooking sub-committee and the customer relations committee were presented by title, being previously available in serial or other form.

Cabinet Member Urges Industry On

Secretary Davis Advocates More Light and Power—Utility Commissioner Praises Industry Policy—Lloyd Urges Need for Sales

PRESIDENT DAVIDSON opened the Wednesday morning general session by introducing C. L. Peirce, chairman of the exhibit committee, through whose efforts and those of his associates the record-breaking exhibition of electrical equipment was made possible.

The report of the insurance committee was presented by its chairman, G. H. Bourne, who stated that insurance was one of the most important subjects before the industry and deserved a geat deal of executive attention since it is a contract against disaster through the waste of capital assets and a tangible agency for producing more efficient operations.

An outstanding feature of the meeting was the address of E. W. Lloyd, chairman of the Commercial National Section. He said that the industry had been notable for a development by successive cycles of interest and activity and that at this time it was entering upon a cycle of intense commercial development.

Complete Electrification the Goal

The commercial goal of the industry, in the opinion of Mr. Lloyd, is the general and complete electrification of America, which requires a competent selling staff and a proper form of rate and pioneering merchandising. At the conclusion of the address R. F. Pack congratulated Mr. Lloyd on his fine talk and stated that the report deserved the most careful attention by all utility executives. He heartily indorsed the revival of activity in commercial affairs instituted by President Davidson during his administration and hoped this interest would be maintained.

The rate situation in the industry was next outlined by Edward Gruhl, chairman rate research committee, who urged all utility executives to study the publication of the committee "Rate Research," which will contain many items of practical value. The committee is studying seriously the effect of the form of rate structure on business development and the influence of the economic characteristics of the business on rate making.

An admirable survey of the industry from the standpoint of regulatory commissioners was given in an address by J. F. Shaughnessy, first vice-president National Association of Railroad and Utilities Commissioners. He said the industry itself was responsible for its achievements, for it had applied private initiative and energy unhampered by outside influence. Regulatory commissions had served as guides during the development and as an impartial agency to protect the interests of the public on the one hand and of the utilities on the other.

Secretary Davis Stirs Audience

James J. Davis, Secretary of the Department of Labor, won the enthusiastic interest of the audience by covering not only the value of good industrial lighting but the general labor situation and the influence of electrical developments on better industrial conditions. He thought the exhibit itself was worth a journey from any part of the United States in that it showed the most recent developments in electrical apparatus, and drew the conclusion that if the leaders of industry in England had exercised foresight to get more production in industry, they would not have had their recent labor difficulties.

Secretary Davis desires labor to get a maximum wage by earning it through maximum production, and good lighting aids greatly in this, he said, by increasing production through removing handicaps to labor and improving working conditions.

Industrial Lighting Campaign Successful

The following address was of particular interest since Chairman J. F. Becker reported for the industrial lighting committee and outlined the complete organization both national and local which carried out the past year's industrial lighting campaign so successfully. He announced these awards of group prizes: First, Edison Electric Illuminating Company of Boston; second, Chicago Industrial Committee; third, Cincinnati Electric Club. Divisional director prizes went: First, H. W. Derry, East Central; second, J. Daniels, New England; third, A. M. Frost, Pacific Coast. Charles L. Edgar accepted the company prize award for the Edison Electric Illuminating Company of Boston and gave the credit for the prize-winning report to Julius Daniels.

Bruce Barton in his address devoted attention particularly to the problem of public relations and stated that just as daring and audacious thinking must be applied to this problem as has been applied by leaders of the electrical industry to solving the problems connected with electrical development. Public relations in the future must be viewed from the standpoint of public service and not from the standpoint of self-defense. No tradition or precedent exists for development of this new type of public relations, but Mr. Barton suggested that it is necessary for industry to prove to the people that it has a soul as well as a brain.

A. C. Marshall spoke on budgeting utility business from the viewpoint of the engineering executive more than that of an accountant and developed the uses of a budget as a tool for executives to use. His definition of a budget was a formulated plan for activity with provisions for control of the plan. The magnitude of the utility business today is so great that a budget was absolutely necessary if an executive expected to keep track of company operations. Many utility systems have just awakened to the fact that they have "just grown," like Topsy, and are embarking upon rebuilding and development programs of great magnitude. The fact of this existing degree of obsolescence and unintelligent building is definite evidence that a budget is necessary.

Public Relations, Interconnection and Market Building Occupy Third General Session

Railroad Electrification Discussed—Influence of Range and Radio Development on Commercial Progress—Interconnection of Systems Influences Social and Economic Conditions

COMMERCIAL aspects of the public relations problem formed the keynote of Wednesday afternoon's general session. High lights of the program were an address by B. C. Forbes, editor *Forbes Magazine*, New York; the presentation by John W. Lieb of some thoughts on central-station policy in railroad electrification; an address by W. E. Creed, president Pacific Gas & Electric Company, upon the social and economic aspects of interconnection in California; a picture of the radio market by David Sarnoff, vice-president Radio Corporation of America, and comment upon the electric range report by Guy W. Talbot, Portland, Ore. Frank Evans, secretary American Farm Bureau Federation, Chicago, presented an exhaustive paper upon the economic situation of the American farmer, followed by brief comment by G. C. Neff, chairman rural service committee. A spirited dialog entitled "Satisfying the Customer" enlivened the proceedings through clever impersonations by Mrs. Ruth Phillips Steinhauser, Southwestern Gas & Electric Company, Shreveport, La., and Miss Vanabel Seale, Eastern Texas Electric Company, Beaumont, Tex.

General Tripp and E. J. Mehren

Dr. E. A. White

C. L. Peirce, Jr., and Dan Pierce

"John Smith" Speaks His Mind on Utility Matters

What "John Smith," citizen and voter, thinks of the electric light and power industry today was interestingly shown by Mr. Forbes in the opening address of the session. The speaker contrasted the popular viewpoint of long ago regarding electric service corporations with the present better understanding of their ends and aims as entertained by the public, and in "homespun" language commended the industry for its good work in improving service and reducing rates. "Mr. Smith" announced himself to be a seeker for information upon the meaning of superpower, interconnection and utility consolidations, and asked the electrical industry to take more comprehensive steps to explain the significance of these trends in company and regional activities. He announced himself as "willing to be shown" like a true Missourian that these great developments are in his interest and stated that he had little desire to embark upon the turbulent sea of public ownership unless forced to do so by selfish and inconsiderate policies on the part of the utilities.

At the close of his address, the speaker presented the *Forbes Magazine* prize for public relations to the Nebraska Power Company, and on behalf of the latter President Davidson accepted a beautiful silver cup with appropriate thanks.

Lieb on Electrification

Chairman John W. Lieb of the electrification of steam railroads committee then outlined the closer relationship which is developing between the transportation and electric light and power industries. Much work has been done during the past few months to clarify the status of steam railroads as large power customers with exceptional load characteristics and service requirements. Eight out of fifteen important electrifications buy all their power from electric utilities. The maximum demand is a formidable factor in contracts for this class of service and the wide variations in conditions under which such business can be secured and retained make a conservative practice in contract drafting vitally essential.

Predicting that the volume of radio apparatus and supply sales in this country will reach $500,000,000 in 1926, Mr. Sarnoff declared that the only danger confronting the radio industry is unwise legislation. The complexity of the radio problem makes hasty legal action threatening to the prosperity of this branch of the electrical art. "I do not believe it to be necessary," said Mr. Sarnoff, "to make receivers pay directly for radio broadcasting. The best proof we have that this is unnecessary is that there are more applications for broadcasting station licenses than can be accommodated in the air. Radio devices are fast taking their place among equipment consuming power. An average 200-watt installation in the home consumes 8 kw.-hr. per month and if such equipment is adapted for use by the 10,000,000 to 15,000,000 owners of receiving sets, the increase in central-station revenue will be very attractive."

For the country as a whole, Mr. Sarnoff estimated that if central stations adopt radio merchandising in 1927 on the basis of careful studies of the market this year, a sales volume of $100,000,000 in additional radio equipment will be marketed.

Guy W. Talbot took the floor and gave the "high spots" of the electric range committee's report, extended extracts from which are published elsewhere in this issue. The speaker emphasized the fact that this report is the product of a thorough engineering investigation as well as an analysis of the commercial value of the electric range as a load builder.

Mrs. Steinhauser's clever dialog showing how to turn an irate customer into a friend and stockholder was then presented by the author and Miss Seale. The skit was warmly received by a large and appreciative audience.

Mr. Creed sketched in bold strokes the enrichment of rural life in California as a result of the improved service made possible by the interconnection of transmission systems. He quoted Lord Rothmere's comments upon the vital importance of electric power development to the prosperity of the United States and emphasized the distinguished Englishman's comprehension of the part unification and interconnection are playing in the elimination of wasteful duplication and reduction in overhead charges. Electric power is the secret of the general prosperity of the American people and the Russian Bolshevik leader Trotsky has recently complained bitterly that every man, woman and child in the United States has at his or her beck and call the equivalent of 50 mechanical slaves. The speaker showed how interconnection has been accomplishing a much-desired decentralization of population in California, working a silent revolution in the industrial and agricultural life of the Golden State, and contributing enormously to the comfort and convenience of its citizens.

Mr. Evans presented the last paper of the session, which reviewed the economic condition of the farmer at great length and visualized the opportunity for load building in the agricultural field as a whole. Electrification of the farm, the speaker said, must follow prosperity in this most essential of all industries, and it is estimated that an investment of many hundreds of millions of dollars will be required to equip the farms of this country accessible to central-station lines for electric service.

Public Policy Meeting Draws Thousands

Edison Guest of Honor—Secretary Mellon Commends the Electrical Industry —Martin Insull Depicts Live Issues—Commonwealth Edison Receives Coffin Medal

WITH the greatest and most colorful audience ever assembled by the electrical industry the public policy session on Wednesday night was honored by the presence on the platform of Thomas A. Edison and by a notable address from Andrew J. Mellon, Secretary of the Treasury, upon the basic factors in the economic progress of the United States. Another enjoyable feature was the award of the Charles A. Coffin medal for meritorious service to the Commonwealth Edison Company of Chicago. Chairman Martin J. Insull depicted the present state of public relations in the industry, and a delightful musical program by Vincent Lopez and his orchestra and by Elizabeth Rethberg, prima donna soprano, Metropolitan Opera Company, interspersed the more serious events of the evening. Fourteen radio broadcasting stations carried the music and speeches to all parts of the East and Middle West.

Mr. Insull as chairman of the public policy committee told the great audience about the public service policy which has enabled the electric light and power industry to grow at such an unprecedented rate, both in magnitude and in popular favor. Quotations from a recent notable address of Secretary Hoover were made to set forth principles of industry development which have long been followed by the executives. The important and increasing movement toward customer ownership which originated in the utility industry was cited as an example of the practical application of a public service policy which has signalized the industry's alertness to every opportunity to establish and maintain friendly public relations. The remarkable economies in management and operation which have resulted in lower costs for electric service in the face of rising costs of other commodities were used to illustrate the principle that the industry makes public service the incentive for maximum efficiency and management.

So many aspects of the business were treated that the audience could not fail to grasp the fact that the utility industry is commanded by men of vision who know their business and have definite ideas of how to establish and carry out policies always based upon good electric service to the American public.

Rewards of Private Initiative

Andrew J. Mellon, Secretary of the Treasury, complimented the association on the part it has taken in increasing the wealth of the country and in bringing

about far-reaching and beneficial economic changes during recent years. Industry organized by inventions and discoveries for mass production has, he said, raised the standard of civilization to the highest plane it has ever attained in America, which enjoys the greatest degree of prosperity and comfort per capita in any country on the face of the globe.

During the meeting Chairman Insull asked the audience to rise as a mark of their appreciation of the presence of the "Father of the Electrical Industry" and invited Mr. Edison to step to the microphone. The famous inventor took his place and said smilingly: "This is the first time I have talked on the radio. Good night."

Samuel Insull Surveys Industry

Social Significance of Electric Service Outlined by Speakers—American Women Co-operating in Movement to Remove Drudgery from Homes—William Allen White Says Electricity Stabilizes American Democracy

AT THE fourth general session of the convention three outstanding addresses were given dealing in a major way with the opportunities of the electrical industry to sell its service in order to stabilize and make better social and industrial conditions. In his address, which is printed in full in another part of this issue, Samuel Insull showed certain trends in the industry with respect to the growth of output in comparison to the increase in investment. The condition, while not critical, calls for study and action, and Mr. Insull then considered the different classes of business available and their effect on the industry situation if fully developed. He also treated of the economic and service influence of interconnections and the possibilities of power interchange relationships with large industrial organizations.

A move for the improvement of American home conditions has been made recently. The co-operation of the light and power industry and the General Federation of Women's Clubs, as outlined in a splendid address by Mrs. John D. Sherman, has resulted in the collection of a great mass of statistics concerning home conditions. One result of this survey shows there are more homes wired in this country than are equipped with running water, and in general there is a very great lack of service facilities and labor-saving devices which would make women in homes free from drudgery. The plan of the movement is to find out the facts and then inaugurate a nation-wide movement to improve conditions.

An inspirational address with a maximum content of optimism and confidence was delivered by William Allen White. His theme was that any industrial groups of public utilities which introduced into the social structure better standards of production and higher conceptions of social conduct and greater freedom from unequal distribution of the world's goods were acting in a larger capacity than mere peddlers in that they were stabilizing the whole social structure and rendering it immune from discontent and radicalism.

Any people will demand certain services and will pay for these services to those who render them. The standard of service demanded depends entirely on the people and how they have been educated. The electrical industry is notable because it has educated people to very high conceptions of electrical service and has given this service in good quality. Their accomplishment in doing this under private initiative and enterprise in itself stifles any idea of political ownership of their utilities. In the words of Mr. White, electricity has been democratized. The rich and the poor pay the same rate for the service and obtain the same quality of service. The industry has educated people in the use of electricity. For example, they first introduced one light into the home. This was followed by more lights, and then came irons, toasters, and finally larger labor-saving electrical devices. The introduction of these things has a greater social significance than commercial. Although those who did this job probably did not realize it, they were rendering the nation a great service in relieving people and industry from drudgery in production and work and enabling them to work and to live under more satisfactory conditions. From this viewpoint, they were stabilizing the institutions in this country and increasing both the power, the capacity and the quality of individuals. They were making it possible to introduce an era where each one earns what he got and will pay for what he produced. In the opinion of Mr. White, the political aspects of democracy are merely incidentals, and those who sell such services as electricity not only guard against communism but in addition advance the standards of civilization.

One aspect of electric service was presented by A. P. Good, chairman of the wiring committee. An essential element in the industry is the lowering of wiring costs in homes, and this committee is doing its best to make service cheap, safe and readily obtained by utility customers. In his report for the lamp committee, Frank W. Smith, the chairman, outlined the tendencies in regard to lamps. There is a general move toward the use of lamps in the 115 and 120-volt ranges. He issued a warning about the increased use of four lamps which were largely imported.

The status of inductive co-ordination was outlined by R. F. Pack and Bancroft Gherardi of the joint general committee. These gentlemen reported that greatly improved conditions had been obtained and that constructive progress was now being had in joint research work, in a proper division of costs and in the establishment of principles for joint use.

Another feature of the meeting was the presentation of prizes by W. H. Onken, Jr., chairman of the prize awards committee. He reported that more than 137 papers had been submitted in the several classes open to men in the industry and that the general quality of these papers was very high. The names of the winners are tabulated elsewhere in this issue.

Sales Opportunities an Industry Challenge

Commercial Men Seek Greater Recognition—Interconnection and Education Discussed—Better Outlook for Agriculture Through Electric Service

CENTRAL-STATION sales opportunities and the desire of commercial men for increased recognition and authority were the outstanding topics at the fifth general session on Thursday, when Vice-Chairman S. D. Heed of the Commercial National Section presented a vigorous plea for more progressive executive outlook upon these activities. Henry L. Doherty, Gen. Guy E. Tripp and Sidney Z. Mitchell also spoke upon the sales problem of the hour, voicing the vital importance of the industry's rising to the opportunity before it to increase public good will and build up loads far in excess of present outputs. Fred R. Jenkins described the educational opportunities before the association membership. Chairman C. F. Hirshfeld outlined the efforts of the Technical National Section to increase its full usefulness, especially to the rank and file of members, and E. J. Fowler discussed the economics of interconnection of systems. General Tripp told how farm work and life are bettered by interconnection and industrial decentralization, and Alex Dow gave an informal whimsical talk on the philosophy of making decisions.

COMMERCIAL PROBLEMS AND POLICIES AROUSE NEW INTEREST

Mr. Heed's report reviewed the development of business building by central stations and declared that both executive support and new vigor on the part of commercial departments are vital to the larger success of utility service. Mr. Doherty discussed the report briefly, defending the commercial progress of the central station as comparing favorably with that of other industries. He declared that for the good of the consumer so far as possible the central station should conduct the merchandising operations of its territory. General Tripp maintained that the central station should lead in merchandising, but that the jobber and the contractor-dealer should form a part of the line of distribution. The central station should pioneer appliances and also sell those which have become standardized, but in the speaker's opinion the electric lamp and flatiron are the only conspicuous examples of completely standardized devices. He strongly urged his hearers not to undertake with cheap or otherwise inferior personnel the important sales work advocated by Mr. Heed.

MITCHELL DEPICTS HIS IDEA OF PROGRESSIVE COMMERCIAL ACTIVITY

S. Z. Mitchell, as president of the Electric Bond & Share Company, displayed great interest in the commercial problems of the central station. He advocated electrical merchandising by all qualified dealers and said that the best commercial practice should be as universal and orthodox as the multiplication table and as general as the department store retailing seen daily. Three elements make up the greatness of the electric industry — one, its inventive and engineering talent, which is well developed; two, its financing, which is on a sound footing with money obtainable at reasonable cost; three, its sales organization. This last in many cases lags far behind the other two. "Many managers seem to think," said Mr. Mitchell, "that if

Recommendation

of Special Committee on Sales Organization and Management

1. That member companies recognize their sales departments as the impelling motive force behind creative market development—then hold them responsible for profitable load building.

2. That sales departments and especially sales executives be given sufficient authority and representation in the company councils to enable proper co-ordination of the sales function with the complete management, thus encouraging creative market development free from the domination of operating expediencies.

3. That member companies develop or provide adequate and competent man power in their sales departments to make possible introduction of complete electrical equipment into the commercial and domestic life of America—that the full benefits of electric service may be enjoyed by people now living, rather than deferring these benefits to future generations.

4. That member companies, having properly evaluated the sales function, then meet the open market competition of other industries for men of experience in selling and sales management.

5. That sales departments be given adequate working tools to insure successful accomplishment, where necessary rate structures should be revised in the spirit of promotion rather than protection—ample and competent personnels should be provided—adequate appropriation for creative market development—reasonable cost allocations that will not unjustly overburden selling with general expense or cost of pioneering new markets.

By the Committee

H. N. McCONNELL
T. F. KENNEDY
S. D. HEED, Chairman.

their plant is modern and spick and span they have done all they should. They say any fool can sell the juice which we produce or make up rates to attract business. This attitude is away off the mark. We can get plenty of beautiful curves in making exhibits of how rates ought to work, but too often these take little or no thought of the customer's needs and have no more to do with business building than the flowers which bloom in the spring. Underpaid sales talent and inefficient personnel often try to get the business which is most spectacular when they ought to be concentrating on getting more business on existing lines and services. These people do not analyze in increment cost and find out how small it is for additional load in present installations."

CUSTOMER WILL PAY FOR VALUE

What the customer can afford to pay for service depends a great deal upon its value to him, Mr. Mitchell declared. If we will make the rate such that the customer knows how to apply it, and how increased service will enable his family to live better and have more comfort and time for home activities and other enjoyments and pursuits, we shall be surprised at the response. On a small property which Mr. Mitchell's organization recently purchased there was a residential energy use of only 15 kw.-hr. per month per home, but by commercial development this has risen to 35, and 100 is anticipated in the not distant future, with hopes of reaching 200 in a reasonable time. Mr. Mitchell urged setting to work to find out what the real increment cost is of adding energy sales in present installations, pointing out that it will be found to be so low, perhaps on the order of 2 to 4 mills per kilowatt-hour, that companies can afford to adopt rates as low as 4 to 2 cents after the fixed charges are met. Let us stop sticking our toes in the water at the edge of the pond, said Mr. Mitchell, but take off our coats and dive into this sales work as it should be done. Mr. Mitchell urged the importance of employing sales people with courtesy, tact and ability. Such people win mental hospitality in approaching customers. The industry needs executives with imagination and creative ability to put this job through. Sales leaders of the type needed should sit with other executives and with the board of directors. In department stores those who merchandise the goods sit at the council table. The same should be done in the utility field. The speaker said that the utility industry must change its methods to do a real piece of work commercially. The day has gone by when the purchase of obsolete or antiquated material and its sale to customers can be allowed. In communities served by the Electric Bond & Share Company standard stores are established on goods streets, attractive showrooms are provided and appliances are sold at a fair profit. It is not necessary to give them away nor to sell below cost. These latter are poor policy and the commissions are also viewing the practice unfavorably since it throws additional burdens upon other consumers. The progressive company studies its increment costs, services appliances and plays the game with jobbers and other retailers in the interest of success for all.

R. F. Pack Elected President

Memorial Resolutions for Departed Members—President Green of American Federation of Labor Talks—Commercial and Accounting Reports Presented

AT THE concluding meeting of the convention one of the most interesting programs was presented. W. H. Onken, Jr., chairman memorial committee, paid fitting tribute to those of the electrical fraternity who had died during the year.

Commercial aspects of the industry were again important subjects for consideration. M. Luckiesh presented a survey of the commercial possibilities of home lighting that offered very attractive prospects for industry action. G. E. Miller told of the great advantage of electric refrigeration for building load factor and increasing consumption with a minimum of new investment. This business is especially valuable because it can be used in residence business. The report of the merchandising committee was presented by the chairman, T. L. Phillips.

In large measure the work of the Accounting Section has been outstanding this year. Its admirable program at the convention and the splendid reports were evidence that the accountants are taking an ever-increasing place and perspective in industry affairs. The brief but comprehensive report of Chairman C. M. Breitinger fully bore out the convictions of competence already held.

The social significance of industry development as reflected in industrial and labor conditions was the theme of the address of William Green, president of the American Federation of Labor. He spoke in different words the ideas so well expressed by Secretary of Labor James J. Davis in an earlier meeting. Only through production can high wages be sustained, and only through the development of higher standards of working and living conditions can social conditions be bettered. Electricity by making power available helps to relieve the worker from drudgery and heavy physical tasks and gives him opportunity to develop his initiative and intelligence instead of his muscles. Its lamps have helped production and its applications in the home and in entertainment and educational phases of living have added to the comforts and pleasures of labor.

Various resolutions of thanks were passed on the motion of W. W. Freeman, chairman of the resolutions committee. The report of the nominating committee was heard and adopted. R. F. Pack was selected as the new president and M. S. Sloan was selected as the new vice-president. The vice-presidents other than Mr. Pack were re-elected. Percy S. Young, vice-president of the Public Service Electric & Gas Company of Newark, N. J., was elected treasurer in succession to W. A. Jones. Other executive officers continue as before.

Comments of Industry Leaders

What the Convention Meant to Many Utility Executives—Action to Follow the Plans Formulated—Social Aspects Predominate in Minds of Some, Others React to Commercial Possibilities

AT THE conclusion of the convention a cross-section of opinion was secured from leaders of the light and power industry. The following comments are fresh reactions to the many remarkable aspects of one of the most successful conventions ever held in the history of the National Electric Light Association.

Dedicated to Greater Service

BY R. F. PACK
President-Elect National Electric Light Association

NEVER before has a convention of the N.E.L.A. risen to such high conceptions of the duty of the industry to its public. This happy state of affairs is the result of long years of devotion to ideals visualized by the pioneers of the central-station and allied manufacturing fields. These ideals are now being made known to the public in ways that carry conviction of the purpose of the industry to go forward to still more remarkable triumphs in service, winning the right to continued prosperity by the dedication of personnel and equipment to the welfare of American civilization in all its phases. No one can see any limit to the good works which lie before this industry. As the varied events of the forty-ninth convention recede into history the fruits of this, the largest gathering of electrical men ever assembled, will long be enjoyed by their customers and the inspiration of the occasion will sustain many a man and woman in the coming months of labor in their home territories. As president-elect, I look forward with confidence and joy to the co-operative achievements possible to us all in the coming year.

Dominant Note Public Relations

BY FRANK L. DAME
President North American Company

ATTENDING the forty-ninth convention—my first in fifteen years—was almost like the return of Rip Van Winkle to his former haunts. I found the same delegates still attending in the interest of their respective companies, and thousands of new faces, but the revelation to me was in the changed policies of the convention itself.

No longer were the problems of technical, accounting and financial detail the keynote of the sessions. Instead, as is the case in the changed attitude of the industry itself, I found the dominant note to be public relations. This subject formed the basis of nearly all of the sessions and indicated the close relationship of the electric industry to the social and economic welfare of the nation.

I was greatly impressed by the fact that the delegates did not confine their sessions to internal criticism, but invited the criticisms of people without the industry, of such prominence as William Green, Secretary James J. Davis and others, who forcibly told them of their problems as seen from the outside.

Every problem was attacked, not from the local standpoint of any company or territory, but from the broad viewpoint of its effect on the industry as a whole.

I am told there were 8,000 people at the convention. What a wonderful thing it would be if our more than 17,000,000 customers could attend one of these sessions! What a greater knowledge they would gain of the vital things that have advanced the industry to its present position of leadership in the United States!

Social Relations the Keynote

BY J. F. OWENS
President Oklahoma Gas & Electric Company

THE convention, perhaps the most successful in the history of the association, was outstanding. Not because of the splendid attendance, not wholly because the leaders of the industry were present, nor yet because of the wonderful exhibits, giving, as they did, a material demonstration of the advance of the industry, but rather was it epochal because of the fact that the spirit or soul of the industry seemed, through all the sessions, to be projected in a very concrete manner. Running through all the addresses and reflected in the attitude of the delegates, as evidenced by their interest, was an expression of an abiding sense of the responsibility that is ours in the development of the new social order that is dawning, and in the continuance of which our industry must play an important part.

More than the dollars and cents, more than kilowatt-hours and turbines was stressed the opportunity that is ours to eliminate the drudgery in the home and the back-breaking toil of the farm; of releasing for culture and development the housewives and homemakers, the factory hand and the farmer. This theme was very fittingly climaxed in Thursday's splendid morning session through the addresses of Mrs. Sherman, Samuel Insull, William Allen White and Gen. Guy Tripp. It was evident that the industry as a whole is deeply conscious of the fact that it and the public are partners in the fullest and best sense of the word.

Commercial Engineering Hits Its Stride

BY GUY W. TALBOT
President Pacific Power & Light Company

CONSPICUOUS among the achievements of the convention just closed is the recognition given to the need of team play between engineers and sales forces, which found typical expression in the study of electric range problems presented to the delegates in Atlantic City. We see in the industry a new interdependence among its technical and business organizations. We

have always had this in good measure, but lately the problems of public utility development have become so comprehensive that their correct solution is no longer safely to be sought by "playing a lone hand" departmentally. Right decisions on matters of commercial policy put heavy responsibilities on personnel and its leadership. The aid of the engineer must be sought from now on in attacking these obligations, even as the help of the commercial man is becoming more and more valuable in many engineering tasks related to load building, the provision of capacity at points specified and in interconnection programs. With this co-operation, we may go forward confidently to new achievements with surer feet and clearer heads.

Growth of N. E. L. A. Challenges Admiration

BY P. S. ARKWRIGHT
President Georgia Railway & Power Company

FROM small beginnings this industry has now grown to man size indeed, and the end is not yet. All parts of the country are contributing to its development, and all quarters will continue to do this so long as the association lives vitally and serves its membership as practically as it does today. Here in Atlantic City has been painted a greater picture of the commercial opportunities of electric utilities than ever before; the importance of seeking still better public relations has been emphasized, and the engineers have come together with profit and inspiration. Now the work of the accountants partakes of this expansion of interests, and all along the line we see bigger things being done in better ways.

We cannot measure the benefits of the countless thousands of contacts such a convention—and only such—makes a reality. When size and quality go hand in hand, as has been the case here, what may not be accomplished!

Public Relations Make Progress

BY R. H. BALLARD
Vice-President and General Manager
Southern California Edison Company

ONE of the best signs of real progress is the care taken to avoid oversatisfaction in relations with others. This industry has reason to rejoice over the improvement of its public relations during the last decade, but a striking note in the convention proceedings has been the realization that almost infinitely more remains to be done than has already been accomplished. There has been no patting of ourselves on the back here, despite the fact that by and large our public relations were never so good. It will be a long time indeed before we can expect even 90 per cent understanding of our industry on the part of the public, but each convention records real and substantial gains in public friendship, and we believe these gains will be held. Fortunate is an industry which serves a public of American intelligence! This is our happy and privileged lot, and if we take up the work of the coming year in this knowledge we may well be confident that its close will see our great industry more firmly imbedded than ever in the regard of those whom it serves so well.

Greatest Labor-Lessening Industry of the Age

BY PAUL A. SCHOELLKOPF
President Niagara Falls Power Company

TO ONE attending an N.E.L.A. convention for the first time this meeting is a revelation of the enormous scope and rapid growth of the electric light and power industry. For years our system has occupied first place among the generating systems of America in kilowatt-hour output, but because we were purely producers and wholesalers of electricity we did not participate in central-station activities through association membership. More recently our interests have broadened through interconnection with other systems, and with this has come a new appreciation of our responsibilities to our industry and recognition of our opportunities for service and co-operation.

This getting together provides a splendid occasion not only for the formal interchange of ideas through the prepared papers and speeches, but an equally valuable informal exchange through conversation and rubbing elbows with the worth-while men of the greatest labor-lessening industry of the age.

The Industry Needs Salesmanship

BY S. Z. MITCHELL
President Electric Bond & Share Company

THERE are no longer any skeptics in the electric light and power industry. Every one is convinced of the magnificent future in store for it—a future that will transcend its present great accomplishments even as these transcend the accomplishments of a quarter century ago. The only point at issue is the speed with which the goal shall be attained. Can the present rate of growth be materially accelerated?

That depends on generalship. Off-hand it may appear difficult, but no task will prove impossible to the industry if the spirit of courage and determination continues to pervade its ranks. Let those who will rest on past laurels. The men of the era, the captains of the future, will press on at double quick to fresh achievement.

Intelligent co-operation is a primary necessity. Some executives urge their engineering departments on, while really the engineers are more often to be found in the van than in the rear. Does not the urging belong elsewhere? If all of our commercial departments were improving the load factor and adding new customers to central-station lines at a rate to keep the engineers busy building stations and extensions, and all the engineers in turn were pounding away at the executives for more money for power plant and other facilities, and all these varied activities were synchronized and co-ordinated and on a large enough scale, the electrical industry would experience a growth which would dwarf all past records and swamp the manufacturers with orders. Then, if, on top of this, zeal and enterprise would lead executives to develop more virgin territory, thereby expanding the service, and to seek new transmission line connections so as to conserve investment, the industry might be said to measure up to its opportunities.

With unbounded faith in the country and enthusiastic pride in the industry, we need have no fear of the out-

come. Money in sufficient quantity will be available for all our legitimate requirements; the best executive, engineering and commercial talent will knock at our doors, and the public will give us just consideration and reward. Americans are not penurious. In the United States it is performance which counts, and the greater the opportunity the fuller the return. Confident of the experience and skill gained in long years of service, let us get on the job and complete it. Eventually the use of electricity will be universal. That is inevitable. But why wait until somebody pushes us? Why not speed up interconnections and develop more new territory now? Above all, why not find ways and means of utilizing to a greater degree the investment already made?

In an engineering sense we have achieved wonders; but, generally speaking, we have not shown the same creative ability in solving our commercial and public relations problems. Better salesmanship backed by sensible rate structures, I feel confident, will increase income and gain public favor faster than anything else the industry may do. We have provided abundant and excellent facilities, but the public doesn't use them enough, chiefly because we have not coupled superior engineering with pre-eminent salesmanship. That as I see it is now the major task before the industry.

Public Service Features Stand Out

BY J. J. O'BRIEN
President H. M. Byllesby & Company

I AM MOST strongly impressed with the character and high ability of the men who are on our program. Of the subjects emphasized, that relating to the achievement of the electrical industry in lightening manual labor and increasing the productive powers of the worker easily stands out above the others. The close relationship between the welfare and comfort of the American people and electrical progress never has been set forth so completely and forcefully as at this great convention of the N.E.L.A.

Develop Sales and Public Relations

BY H. B. FLOWERS
President New Orleans Public Service

IT WOULD be trite to say that this is the biggest and best convention of the N.E.L.A., because this gathering of leaders must always reflect the state of the electrical industry, and each year finds that young giant head and shoulders above his shadow of the past year. Largest attendance, most inspiring addresses and discussions and reports, therefore, are a matter of course. But not so with the record of actual accomplishment for the twelve months reviewed and the unusual promise for those to come. These are the things that impress me most in this convention, with special emphasis on two important phases of our business. The first is demonstrated in the exhibits, far superior to any in the past in numbers, in scope and in promise of future public service. I would particularly single out the display in electrical refrigeration, which I regard as the outstanding recent development of our industry, assuring a real continuous load. That is an infant we cannot afford to neglect. The other matter of moment is the genuine achievement in public relations. For years we have uttered loud amens to fine addresses, only to go home and promptly forget. Now, more and more each year, we are actually doing things and progressing toward a realization of the supreme importance of common-sense attention to the attitude of the people we serve. Altogether, this convention leaves a mighty good taste in my mouth.

PRIZE AWARDS

Charles A. Coffin Medal
COMMONWEALTH EDISON COMPANY OF CHICAGO

Doherty Prize
H. W. HILLS, Philadelphia Electric Company

Harriet Billings Prize
FRANK M. HARRIS—Pacific Gas & Electric Co.

H. M. Byllesby Prizes
First—H. L. GRUEHN, Consolidated Gas, Electric Light & Power Company
Second—C. E. MANNSCHOTT, Jr., Oklahoma Gas & Electric Company
Third—E. S. MANSFIELD, Edison Electric Illuminating Company of Boston

Martin J. Insull Prize
PAUL RENSHAW, Memphis Power & Light Co.

James H. McGraw Prizes
First—N. J. ROBERTS, Ohio Public Service Co.
Second—H. G. D. NUTTING, Detroit Edison Co.
Third—S. S. DOUGHERTY, Toledo Edison Co.

Arthur Williams Prize
W. B. JONES and H. F. SMIDDY, West Penn Power Company

Frank W. Smith Educational Prize
L. J. LEAVIT, United Electric Light & Power Co.

Forbes Prize
NEBRASKA POWER COMPANY

Industrial Lighting Prizes
Community Prizes
First—EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON
Second—CHICAGO INDUSTRIAL COMMITTEE
Third—CINCINNATI ELECTRIC CLUB

Geographical Division Director Prizes
First—H. W. DERRY, East Central
Second—J. DANIELS, New England
Third—A. M. FROST, Pacific Coast

An Inspiration and a Challenge

BY M. S. SLOAN
President Brooklyn Edison Company

THIS convention has been an inspiration to me. It goes without saying that our conventions will have a splendid program and a large attendance—we have come to expect these things; and we expect that each year's convention will surpass all its predecessors. Inspiration lies in the fact that at such a gathering we are able to get, as in no other way, a picture of what our great industry is and what it is doing. We get this picture, not only from our own members, but also from those people outside the industry who are our guests, who bring to us the views of the public.

The record of our progress, reported in these sessions by our members and reflected in the views expressed by our guests, is both an inspiration and a challenge. It is a challenge to us to continue and enlarge our accomplishments. We are able to meet that challenge, I feel confident. We never have failed, never have gone backward, and we aren't going to begin to do so at this period in our career. My most earnest hope is that we shall be able to keep the public's understanding of our accomplishments abreast of our steady advancement and to take no risk of forfeiting the good opinion we now enjoy by giving too little attention to the necessity for cultivating and deserving the confidence of the public first, last and always.

High Lights

PAUL A. SCHOELLKOPF—Greatest labor-lessening industry of the age.

H. B. FLOWERS—We are actually doing things and progressing toward a realization of the supreme importance of common-sense attention to the attitude of the people we serve.

J. J. O'BRIEN—The achievement of the electrical industry in lightening manual labor and increasing the productive power of the worker easily stands out above the others.

M. S. SLOAN—Keep the public's understanding of our accomplishments abreast of our advancement.

S. Z. MITCHELL—We have provided abundant and excellent facilities but the public doesn't use them enough, chiefly because we have not coupled superior engineering with pre-eminent salesmanship. That as I see it is now the major task before the industry.

R. F. PACK—Every possible effort should be made to increase business as it will be less easy to get business in future.

JAMES J. DAVIS—Develop new machinery and better machinery so that labor may produce more and so earn more.

BRUCE BARTON—Mankind has solved the problem of production; the new political economy must deal with the problem of distribution and the problem of public relations.

Short Comments on the Convention

J. E. DAVIDSON, *president N.E.L.A.*—The magnificent convention is a crystallization of the efforts of the committees of the geographic divisions and is the fruition of the co-operation of the members and officers of these groups. The result is great.

E. W. LLOYD, *chairman Commercial National Section.*—The best thing about the convention to my mind is the reconstruction of the program, so that parallel sections cease to confuse an attendant as to which part of the program he wishes to hear. It is a marvelous convention, and one of the best we have had.

W. H. JOHNSON, *president Philadelphia Electric Company.*—It is perfectly splendid. I think I get to feel that way about every convention, but this time I feel it stronger than before. The papers are good and the entertainment program wise and moderate.

B. J. MULLANEY, *vice-president People's Gas Light & Coke Company.*—I have never seen so many headliners in the industry before placed where they could head the program. No outside speaker can speak for the industry in a way to educate the new members so well as those that have built it. These magnificent audiences mean that the young men of the industry are sitting at the feet of its veterans to learn its story from them. It is the best convention I have seen in the last six or seven years.

GEN. GUY E. TRIPP, *chairman of the board, Westinghouse Electric & Manufacturing Company.* — The N.E.L.A. convention for 1926 is undoubtedly the finest that has so far been held. Particularly impressive is the large attendance, and especially the active interest being shown in the exhibits. From an industry standpoint, the most striking features of the exhibition are the displays of electric lighting and refrigeration. An industry that can show such active development in both its oldest and its youngest branches is certainly virile and a long distance from stagnation.

ALEX DOW, *president Detroit Edison Company.*—As a convention it looks very, very natural. Its big attendance is evidence of how great the industry is becoming and the full meetings mean that new blood is entering the business, for it is the newcomers who drink up most avidly what to us old timers is by now a very old philosophy.

W. E. CREED, *president Pacific Gas & Electric Company, San Francisco.*—It is magnificent. It passes all predecessors and means that the convention has become energized with the industry's spirit and zeal.

DAVID SARNOFF, *vice-president Radio Corporation of America.*—Its outstanding feature to me is the carrying of its work over into an interpretation of its social significance.

BRUCE BARTON.—It is bully. I never attended a convention so full of fire and go.

M. H. AYLESWORTH, *managing director N. E. L. A.*—Splendid is the only word for it. A momentum is being created that will work for us for years.

President Davidson Surveys Progress*

Notable Address Sums Past Accomplishments in Electric Service—Opportunities for Better Business Indicated —Rural Service and Commercial Aspects Accented

WHAT all of us in this, our forty-ninth annual convention, have to say to the people of the United States is that, since the beginning of the industry, although we have sought to make a living for ourselves and to make a fair return to investors who risked their savings in the development of electric light and power, through it all we have put public service first.

We have put service to the public first because we recognized frankly that there could be no progress for the industry itself, for the managers of it or for the investors in it unless the public wanted to buy what we had to sell.

It was a daring enterprise at the outset. It required capital, but, far more than that, courage, to visualize, as Coffin, Westinghouse, Edison, Mitchell and Insull did, a nation relighted, revitalized and virtually reconstructed from coast to coast by the miracle of electricity. Electricity in those early days, when Edison was launching the first electric light and power company, was not understood, nor did many persons have faith in what might be accomplished by it. It required gallantry of spirit to go through with it. The pioneers in our industry had the character that risks everything for an ideal, and they had the vision that sees, far off, the end of the tangled road.

J. E. DAVIDSON

It is a far cry from those early days, when no one knew or understood the miracle of electricity, to the present day, when we find it the major motive power of America.

What electricity has meant in terms of national wealth is shown by the fact that electric motors throughout the country are doing every day as much work as could be accomplished by 170,000,000 men. The population of the United States is 116,000,000. Forty-five millions approximately are in gainful occupations. It would require four times that many to duplicate the work of electric motors. Is it any wonder that self-seeking politicians, when unable to hold their followers by more honest leadership, seek to interpret the serviceable progress of the industry in terms of monopoly or of oversize?

Certainly the task that had to be accomplished in the last 40 years was no task for midgets or Lilliputians. If there had been state regulation, such as we have today, in the early days, when few persons had faith in the future of electricity, I doubt seriously whether the industry would have flourished.

We are still young in the electrical industry and our task isn't nearly finished. We can again double the production of the United States; we can irrigate lands that are going to waste; we can increase the yield of agriculture; we can lift more of the load from women's backs—we can do all these things if they will continue to supervise us, but not Oslerize us.

Perhaps no job that is unfinished can be called well done, but measured in terms of world progress, we find ourselves amazingly progressive. Other nations continuously are sending visitors to the United States to see how we have made the progress that has been achieved. A few figures will summarize this progress. Here they are:

Home customers (wired homes), Dec. 31, 1925	13,460,000
Commercial customers	2,750,000
Industrial customers	675,000
Total investment in industry, Dec. 31, 1925	$7,350,000,000
Gross income of the industry during 1925	$1,425,000,000
Total number of customer owners as of Dec. 31, 1925	1,322,367
Stock owned by customer stockholders, shares	9,775,572
Total number of kilowatt-hours generated during 1925	60,250,000,000

Not even political agitators have been able to challenge the fact that our industry, working under state regulation, needing vast amounts of capital for development, working with narrow margins of profit and slow turnover of invested capital, nevertheless has made electric light and power among the cheapest if not the cheapest of all commodities in daily use. In the enduring struggle of political management versus non-political management the performance of the electric light and power industry furnishes a complete and conclusive indication of what can be accomplished by regulated service, instead of unregulated service of, by and for political bureaucrats, with taxpayers footing the wasteful bill.

*Abstract of address of President James E. Davidson at the N. E. L. A. convention, Atlantic City, May 18, 1926.

Let me set before you, briefly and without argument, the record of progress:

Electric service costs less today than at the beginning of the European war, whereas the general level of prices is still 60 per cent above the pre-war level.

The number of domestic customers of the electric light and power companies has doubled in the last six years, but there are still more than 10,000,000 homes waiting for electric service.

The new capital put into this vital American service during the past five years has amounted to $3,600,000,000—an amount equal to the total investment in the industry five years ago.

Thus since 1920 the investment in electric light and power stations and their transmission and distributing lines has equaled the total capital provided in the 39 previous years, beginning with the first Edison station in New York in 1882.

Compared with any other industry—compared even with the corner grocery store—the ratio of capital to the turnover of gross profit is abnormally large in the electric light and power industry.

To obtain a gross income of $1,425,000,000 in 1925, a total capitalization of $7,350,000,000 was required; and out of the gross revenues must come all the operating expenses of the industry, including taxes, and a fair return upon the savings of the public invested so confidently in the business.

Whereas the average store turns its capital over five times in one year, our industry turns its capital over only once in five years; but skillful management, constant improvement in machinery and the vast economies that have come from interconnection have taken up the slack and enabled us to push forward.

Greater Service Opportunities

Both from the standpoint of our selfish interest and from the interest of the public I have gathered out of my year's work as president of the association a strong feeling that the electric light and power companies should engage more intensively in the introduction of labor-saving appliances to their customers, especially in the homes. Through electric labor-saving appliances more and more women are being relieved of the drudgery of washing and ironing clothes, cleaning their homes and cooking the food. Electrical appliances are giving mothers more time for their children, more time for mental companionship with their families. Women are no longer becoming middle-aged at 30, the life taken out of them by household drudgery. And as the study and development of correct electric lighting continues, the nation will find that the evil of defective eyesight, caused to a great extent in the past by poor lighting, is halted and diminished.

Rapid as the growth of our industry has been, the gratifying part of it has been the increasing participation of the general public in this growth. We should be fully justified in pointing to the electric light and power industry as a new experiment in financial and industrial democracy. Any one today can become part owner in an electric light and power company. If any one says there is an absence of competition in this industry, let him examine the facts and, if he is honest, he will hold his peace.

Moreover, it has been one of the achievements of the National Electric Light Association to bring about a uniform system of cost accounting. Comparative statements now can be contrasted without the aid of a mind reader. If the same thing could be said of municipally owned companies, there would be no further argument on the political side of the fence. Even the politicians would move to make unanimous the popular verdict in favor of *business* management.

The number of our new stockholders exceeds those acquired in any previous year and is 80,000 in excess of those gained in 1924. There are at present 1,300,000 customer stockholders, owning 10,451,843 shares of stock.

Rural Service Advanced

Throughout the year, in the difficult and outstanding problem of farm electrification, the National Electric Light Association has whole-heartedly co-operated with the government and individual states, as well as with the organizations representing the farmers themselves, and this work has progressed to a point where the number of organized district committees has been increased during the past year to twenty.

Experiments are being carried forward in key states to determine the extent and manner in which the farmers may be able to make economical use of electric light and power, and the actual number of farm customers has been considerably increased during the year 1925. Detailed reports will be made by the committees in charge of this work, and I merely wish to add that no work that this association may do, no work that the industry itself may do, can have more beneficial results than will accrue from the sound application of electric power to the nation's agriculture. We are engaged in a task which, if it can be accomplished successfully, will lift the burden from farm women and from that great body of men without whose industry and energy the nation itself could not survive.

In the final analysis the question rests with the farmer. He will decide how quickly electricity is to be used in agriculture. If he creates proper sentiment, making these experiments and tests possible and productive, and if he uses the energy when it arrives at his door, to the extent that it may be an economic success, the time will be quickened when the majority of farms in America will be electrified.

There are other major jobs to be done by our industry. The work of lighting homes and furnishing power in urban territories is still unfinished, but is being pressed vigorously. The work of translating the wasting power of waterfalls into useful power that will relieve human drudgery is going forward. The task, however, that will mean most to the nation in the future is the farm electrification work.

Through the front door of the home electricity has brought comfort, convenience, happiness and contentment, and through the back door it has forever banished drudgery. To industry it has brought a marvelous transformation. To the office and store it has brought improved and appropriate lighting, more conveniences and increased sales. It has trampled inefficiency, replacing it with economical production. It has forestalled death by bringing about more sanitary working conditions and safety in machinery. It has made the workingman more contented by simplifying and making easier his labor and by giving him an opportunity to increase his earnings through increased production. It has made his home a happier and better place for him and for his family.

Owen D. Young on Public Relations and Public Ownership*

Urges Closer Public Relations by Strengthening Private Ownership—Time Ripe for Fulfillment of High Ideals—Electric Utilities a Mighty Factor in Social Betterment

IN MY VIEW, the difficulties between the public utilities and the public arise from the fact that the public utility managers know too much about their business and the public knows too little about it. When the clash comes, there is no single impartial tribunal skilled in the art which is able to deal comprehensively with the issues, no matter how vital they may be. Our nearest approach to it are the public service commissions, which, in spite of the large number of able and impartial men who have sat on them, are still handicapped by political interference. The result is that in one form or another the contest still goes on, not to be sure in such a brutal way as it did a quarter of a century ago, but it goes on. If the utilities do something which the public dislikes, even temporarily, it strikes back, seldom constructively, often destructively.

O. D. YOUNG

The widespread distribution of public utility securities, and especially the securities of a public service company among its own customers, is a way by which such customers may be induced to study the utility problem impartially and open-mindedly. They must think both as customers and as shareholders, and all of us think more impartially when we have the responsibility of making a decision between divergent interests.

We then throw away partisanship and substitute understanding. May I say to the public utility managers, when they are asking the public to take stock in their enterprises and assume the dual capacity of stockholder and consumer, that the managers themselves be careful to see to it that they take stock in the public welfare and put themselves in the dual capacity of citizen and operator? In that capacity, when questions affect the public interest, they must learn to be as impartial as they ask their customer-owners to be.

Partisanship is the poison of impartiality. If disarmament is to take place between the utilities and the public which they serve, let the poison gas of partisanship be eliminated by both sides as the first effective step toward peace. There is scarcely a public utility operator in the world who will admit that he is unfairly partisan. He is keen on making a success of his company; he is devoted to its interests; he is close to its affairs. His heart is in his work. He wants something and it seems clear that he should have it. He goes after it and resents interference. It is not conscious partisanship of which I speak—it is that spirit of devotion which, like extreme nationalism, unless carefully guarded against, leads to war. On the other side, there is scarcely a politician who is so brazen as to say or even to think that he will destroy the effectiveness of a public utility whether it be right or wrong. He, too, for the most part, with little knowledge of the problem, sees what he thinks is the interest of the public and goes out to get it. He may think that it will be of political advantage to himself and to his record to get the result, right or wrong, just as the public utility manager may think that it will be of advantage to himself and to his record to increase the earning power of his concern. The public and the investors are the real parties in interest, and they must not permit the personal ambitions of the spokesmen of either to do injury to the interest of both.

May I suggest to both representatives that they try carefully to study the other fellow's problems—that each try to put himself in the other fellow's place and conscientiously determine what, under the circumstances, it is wise and fair to do. The way to peace requires not only an elimination of the fundamental causes of war, but also that the superficial flourish of arms menacingly be done away with.

Now, there is another question around which war has raged during the thirty years of my acquaintance with the public utility business. This war, like all wars, has consisted of battle after battle and skirmish after skirmish, in which lines broke or wavered or fell

*Abstract of address by Owen D. Young, chairman of the board, General Electric Company, made at N.E.L.A. convention, Atlantic City, May 18.

back. The war has been continuous and at times severe. I refer to that conflict which has been going on during all this period with greater or less intensity under the respective flags of "public ownership" and "private ownership." What have we to say about that? What have we learned about it in the last quarter century? What is the outlook for the future? Sensitive questions, it is true.

To change the figure, that issue has carried high potentials on both sides—little effective conductivity between them—a flash of light subsequently discovered to be a thunderbolt—great heat, and some devastation—then as dark as before. Must this continue? Can we not, as the result of thirty years' experience, find sufficient conductivity between these potentials to enable us to hang out a few lights, miniatures though they be, which will help to guide us on our way? Perhaps the lightning then will not be quite so dazzling or the thunderbolt quite so severe.

It seems to me that the experience of the last quarter century shows that efficiency and economy of operation is best accomplished by private ownership. I have had the opportunity during the last few years to observe the operation of publicly owned enterprises in most of the principal countries of the world. By and large, their efficiency in service is markedly less than that of the private companies. Indeed, it is scarcely too much to say that the best of the publicly owned enterprises are comparable only with the worst of the privately owned concerns. In many cases no one but the government would dare to give such inadequate and inefficient service. . . . I wish to emphasize that I make no reflection upon the men who are in charge of these bureaus. They are faced with the greatest handicaps and limitations. Legislatures, unfamiliar with their business, in a rage for economy, cut their appropriations and curtail their activities. Other legislatures, having a substantial and perhaps unexpected surplus balance, dump large sums on condition that vast enterprises be begun, and many for long periods may be left unfinished. I admire the patience and fortitude as well as the ability of many of the men who man these government organizations. I am merely saying that, in my judgment, the govermental organization is an inefficient and uneconomical instrument to do our public utility business.

Adequacy of Service

My observation is that in the earlier years of the industry the government-owned enterprises extended their service more readily to individual consumers in their areas than privately owned concerns. They were able to do this because the industry then had difficulty in financing and the government-owned concerns had recourse to the public treasury and did not have to take into account either immediately or eventually the net earning power of a particular service. I am not discussing the question of whether it is wise for the government in any form to subsidize uneconomic extensions of service. All I am saying is that when there are no economic checks and there is a political expediency in making extensions, the tendency is to make them. They may not be economic, but they are made.

During the earlier part of the twenty-five-year period which I am discussing I think the record of some of the privately owned utilities was not good in the matter of service extensions. I can well remember when it was the policy of a lighting company in an important city of this country to discourage residential consumers. It preferred to serve only large users in the industrial or commercial section and was quite willing that all outlying residential districts should burn gas, kerosene lamps or even candles. Then, again, it is only a relatively few years ago that there was the greatest reluctance on the part of many companies to make what are known as agricultural extensions. The slide rule did not show to the engineers and financiers in charge an adequate return on that particular form of service. They even refused to study it intensively. At the same time, certain government-owned enterprises were widely extending their services in agricultural districts, uneconomically to be sure, but nevertheless extending. Socially, it may have been wise. Politically, there was no doubt about it.

Now I am glad to say that, so far as I know, residential consumers are welcomed in all cities, and that during the last few years the light and power companies of this country, under the enlightened leadership of this association, have taken the greatest interest in studying and developing agricultural lines. In order to do this, they have had to study agricultural uses, and I venture the prediction that before many years the privately owned light and power companies will have discovered how to serve the farmer at a profit, and that correlatively they will have taught the farmer to use that service to his profit and social advantage. There was a time when it looked as if it might be necessary to promote government-owned enterprises in order to develop widespread electric service and obtain for the state as a whole the social benefits resulting from it. It now seems certain that that problem will be worked out on a sound economic basis without calling on that dangerous instrument, the power of taxation, to accomplish it.

Unit of Operation

In the earlier days the warfare was between municipal ownership and private ownership. That is to say, each city had its own complete outfit for the generation and distribution of electricity. The question was whether that self-contained unit, operating wholly within the limits of one municipality and occupying in some degree the public streets, should not be owned by the city itself. That war went on—a few plants were taken or constructed by the municipalities. If electricity were now supplied from self-contained units in each individual city, I venture the statement that the war would continue. The development of the art, however, has changed all that. It is no longer economical, broadly speaking, to build a generating plant to supply a single city alone, unless that city be very large. In consequence of the development of large units more economical in production and of highly efficient transmission systems, we no longer have self-contained units in a given city. This lessens the investment in spare machines to insure service and enables advantage to be taken of greater diversity of demand in a wider market. The economy of this character of operation has been fully demonstrated. The point is that the art has forced such an advance in the industry that the question of municipal ownership and operation of generating and distributing facilities is no longer a practical question. If we are to have government ownership, it cannot be effective unless it includes a larger area than a single city. So we have state ownership and operation proposed. But even so, economic laws

are no respecters of political boundaries. The political boundaries of a state may make a most uneconomic and inefficient territorial unit for power distribution. One needs only to think of cities like Manchester, Nashua, Lowell and Lawrence on the Merrimac in New England to see that from the standpoint of power Manchester and Nashua have much more in common with the Massachusetts cities than they have with Dixville Notch. So, from my point of view, state ownership faces grave economic difficulties.

It may be possible, of course, to work out some kind of regional government ownership, but any one who has had experience in trying to co-ordinate political activities of different cities and to get co-operation between them will, I think, be discouraged in such an enterprise, however ardent a believer he may be in the theory of public ownership.

Perhaps we must face then, as the next issue, ownership by the federal government of the power facilities of the United States. In face of well-nigh universal objection to a greater centralization in Washington, it seems scarcely worth while to debate this question now. Our knowledge must be vastly wider and our experience more satisfactory before the people of this country will consent to the vesting of such tremendous power in a bureau of the federal government. I dismiss the matter now with that statement.

Special Water Powers

There is a class of water powers which, in my judgment, must be separately considered. No suggestion has yet been made which adequately meets their needs. Where vast rivers either on international boundaries or within the United States require development for several purposes, such as navigation, irrigation and flood control, as well as for power, there arises a new kind of question which is wholly unrelated to the old controversy of government versus private ownership. The discussion of this question has been clouded by the old animosities. The private-ownership people feel that if the government has anything to do with the development of power in these composite situations, it will be merely the starting point from which the advocates of public ownership will advance their operations. On the other hand, the public-ownership people feel that the privately owned companies which seek to throw dams in these great rivers, and incidentally perforce take over the effective navigation, irrigation and flood control, are so intrenching themselves in purely public operations as not only to make all thought of public ownership impossible, but to create instruments of oppression rather than of service. While this debate goes on vast rivers go unharnessed for power, waterways are undeveloped, floods drown us and droughts devour us. May I not call for a broader view in the public interest from the representatives of both the utilities and the public? Can we not find a way by which the sovereign powers of states may be recognized in the location, construction and ownership of these tremendous structures in great rivers supplying governmental services as well as power? Perhaps the key to it is the control of water. After all, it is the water which is the agency of all. It is the water which must be stored to prevent floods. It is the water which must be drawn down to facilitate navigation and irrigation. It is the water which must be drawn down to create power. In my judgment, the sovereign power of the state should determine which of these needs is most important in the public interest from time to time. If the government prefers to use water for navigation or irrigation rather than for power, I think it should have the right to do so without protest, much less opposition, from any power company. But the water must be used.

If power can be incidentally generated from the stored water, there can be no reason why that power should not go into and become a part of the power supply of the contiguous district within reach of economical transmission. Some plan will have to be devised by which the amount and continuity of the supply of water, at least as to minimums, can be determined in advance as the basis for payment. The absolute essential of an electricity supply is that it be permanent and continuous. Interruptions make it almost valueless. The practical engineering problem, in my judgment, is not difficult, once we remove from the question the heated controversies, the prejudices and the suspicions of an earlier day.

Much has been made of the question as to whether these dams should be built and owned by the government. If the dams really serve the great purposes of navigation and flood control, which are clearly governmental activities, then it seems to me public ownership of them cannot be objected to. Personally, I prefer that the construction and ownership of such an enterprise be in the hands of a public corporation, the stock of which should be government-owned, with the provision that that corporation finance the enterprise with its own securities. Our experience with the War Finance Corporation, which is a wholly public concern, and with the farm loan banks and the Federal Reserve banks, which certainly have a large public character, leads me to believe that we can obtain men of technical qualification and high purpose, free from political bias, to administer these enterprises in such a way that development can be most advantageously achieved with justice to all interests, both public and private alike. The alleged fear of tax-exempt securities is nothing more than a firecracker thrown by the roadside, designed to scare the horse.

High Aims for the Future

As an observer of the world's economic development, I speak with great pride in the achievements of the light and power industry of the United States. To my knowledge no industry has made such rapid advance since the great war and none has achieved a more useful or helpful result. It is the ambition of every foreign country to have the benefit of such a development. It lies at the root of labor troubles and of social peace. To the extent which we may substitute great supplies of cheap inanimate power for that generated by the muscles of human beings, we shall not only relieve the exertion of workers, but we shall increase their output, which is the only way of advancing wages and living conditions. . . . A service which not only meets its own economic requirements, but supplies social needs—that is the target of the industry. You are not afraid of new inventions and new engineering in your physical plants. You are accustomed to rapid progress. May I suggest that invention, improved engineering and courage to take the road are needed now more in the social than in the physical sciences? I recommend that we take the overhead of research and experiment in the social field now, when the social balance sheet is stable, and not postpone it to the day when it may be too late.

Public Policy and the Utilities*

Centralization of Energy Production and Interconnection of Transmission Systems Introduce Major Elements that Affect Public Policy—Federal and State Control—Political Ownership

By MARTIN J. INSULL
Chairman Public Policy Committee

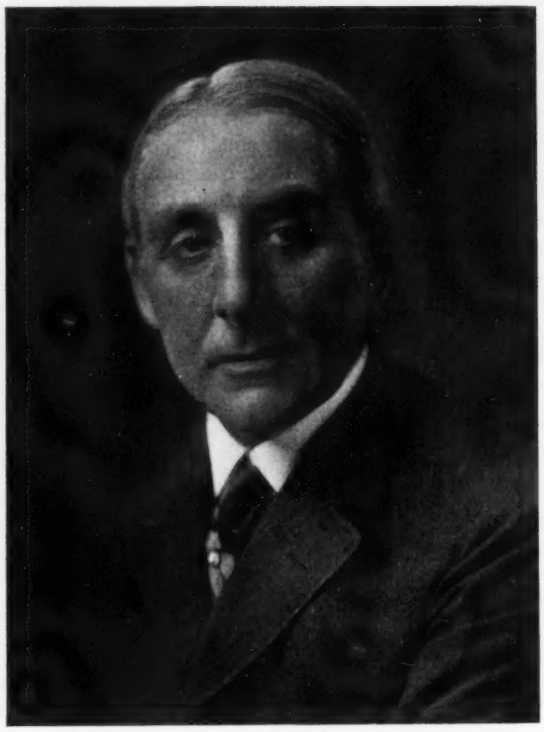
LARGE among the questions of "broad public import" during the past few years have been those growing out of the centralization of generating capacity, feeding transmission systems over broad areas and for the economic and service advantages of the interconnection of these large centralized systems one with another. These very natural developments of the industry, the eventuality of private initiative and enterprise, were employed as background for appealing written and spoken pictures of "superpower" or "giant power," and a resultant agitation of the advisability, "for the protection of the public," of having the industry politically owned instead of privately owned. It is a tribute to the good sense, vision and fairness of the American people that these suggestions met with very little favor, or, in the language of President Coolidge, "met with unmistakable defeat."

The grouping of these centralized districts into larger districts by unified control of companies operating in contiguous territory brought a problem in regulation regarding the sale and resale of electrical energy passing over state borders. This committee has been very firm in its opinion that regulation of the electric light and power operating companies should be under the states, and under no condition should it be necessary or advisable for the protection of the public or the companies that federal regulation should take any part.

The great advantage to the public of interconnection was well exemplified during last summer's drought in some of the Southern states. Had it not been for the electrical interconnection of the power resources of those states by which energy could be drawn from the territories less affected to those more affected by the drought, an appreciable portion of the industries of the South would have been shut down for lack of power. This committee, recognizing the importance of interconnection and its advantages to the public, recently adopted the following resolution, which, notwithstanding that copies have been sent to all class A members, the committee, on account of the matter's great importance, wishes again to call forcibly to your attention:

Whereas, there are certain advantages in economy and reliability of service to be procured by interconnection, and

*Abstract of report of public policy committee presented at N. E. L. A. convention, Atlantic City, May 19.



M. J. INSULL

Whereas, the problem of interconection has attracted public attention to an extent that is encouraging many agencies to seek a solution and impose it upon the industry, and

Whereas, the industry itself is the only agency in a position to find an effective solution and put it into effect; therefore, be it

Resolved, that the public policy committee of the National Electric Light Association hereby adopts as a national policy of the first importance the solution of the interconnection problem.

Managers of operating companies are urged to establish with neighboring companies with minimum possible delay:

(1) Equitable and mutually advantageous operating agreements for interchange of power.

(2) Co-operative studies of extensions of systems with a view to obtaining all possible advantages that can be derived from interconnection.

Headquarters, the national committees and the geographic divisions of the N.E.L.A. are urged to lend all possible aid to managers of operating companies in carrying out this policy.

To facilitate interconnection, voltages, especially those above 60,000, should be standardized with the least practicable delay.

This resolution emphasizes the assistance the Great Lakes Geographic Division has been to the interconnection policy by its continuous study of the problems of transmission and interconnection in its own territory and in contiguous sections of the three adjoining geographic divisions. It is to be desired that more geographic divisions shall emulate the work of the Great Lakes Division in this important study. It would, indeed, be a helpful step if the power survey committees in all geographic divisions co-operated with each other in working toward such standardization of practice as is suggested by the resolution in connection with voltages above 60,000 as would conserve the best interests of the industry and the public toward the end that interconnection can become still more general and with the greatest possible economy of operation of the interconnected lines.

In last year's report attention was called to a growing antagonism to the electric light and power investment or holding company. This condition still exists on account of misunderstanding on the part of the public as to the exact relation of these companies and their financial structures to the rates charged it for service. The public should understand that in no way can the investment companies affect the rates it pays for electric light and power service. Its rates are based purely upon the value of the physical property of the operating company serving it used and useful for the public service, irrespective of where the ownership of that property may rest. Whether an investment company is interested in the securities of the operating company or not, the operating company still can only issue such securities as the state regulating body allows it to issue, and that body also prescribes the class of service and the conditions under which it shall be rendered by the operating company. The public is, therefore, fully protected in the regulation of the operating company and is in no way affected by the actions of the investment or holding companies. It is, therefore, unnecessary in so far as the public's interest is concerned in electric light and power service that anything beyond the operating company should be the subject of regulation.

On the other hand, it cannot be expected that the public, without reason to be familiar with the fundamentals of utility financing, can hear of high prices being paid for operating properties and not feel that in some way it is affected. This feeling is groundless from the standpoint of the strictly consuming public, but it has foundation for that portion of the public which may invest in securities growing out of such purchases.

While these matters were in mind in last year's report, when the committee cautioned the public against unwise speculation in utility equities created by those having only a superficial knowledge of the underlying principles of the industry, the committee feels, in view of some prices paid for operating properties during the past year, its duty is now clear to call marked attention to this condition. It does this not only as a protection to the investing public on which the industry has to depend for its new money, but co-equally as a protection to our industry, which in the finality will be hurt by such practices.

Water Powers Not Yet Understood

There is still broad misunderstanding on the part of the public with regard to the value of water powers, and the committee reiterates the necessity of educational work upon this subject. The report of the committee presented in 1924 particularly points out that many water powers could only be used as coal savers, and that their value as such became less and less with the reduction in the cost of a steam-generated kilowatt-hour. Since that report considerable progress has been made in the reduction of costs in steam generating stations, due to increased efficiencies that have come with developments in the art, until the coal costs of a kilowatt-hour today are being cut down in some of the recently built stations below a figure considered improbable, if not impossible, a few years ago. These advances in steam generation reduce the economic value of many water-power sites to such a point that they should not at present, in the public's interest, be converted into hydro-electric power plants. Their economic value as such must in the future be determined by the price of fuel.

Another feature of the water-power situation is that in the cases of large, really economic, possible developments some of our legislators endeavor and do make them the subject of political dispute and demand special privileges for them other than those provided in the federal water-power act. The prominence of this situation during the past year and the fact that there is in existence the necessary governmental machinery made necessary and advisable your committee's stating the association's position in this matter. The following resolution was passed for the guidance of its members:

> We should not depart from the national policy established by the federal water-power act, and the handling of the power question should be placed in the hands of the Federal Power Commission to give licenses for the use of the water for power purposes under the federal water-power act without imposing a new system of allocation.

Rural Electrification

General interest in rural electrification continues to grow. On May 12 and 13 the Agricultural Publishers' Association held a convention in Chicago and devoted the entire time to the discussion of rural electrification by prominent agricultural and utility representatives.

The American Society of Agricultural Engineers has created a Rural Electric Service Section in its organization, and at its annual convention in June a large part of the time will be devoted to the discussion of rural electric service. The ever-growing interest in rural electrification should impress our industry with the importance of this development and should spur us on to greater activity in extending electric service to the farm.

During the year committees on the relation of electricity to agriculture have been organized in Michigan, Nebraska and South Carolina, making a total of twenty states having committees of this kind. State agricultural colleges in each of these commonwealths, co-operating with the state committees, continue to carry on intensive and careful experiments of applications of electric service to farm operations.

The reports for the year 1925 show that on three experimental lines, which have now been in operation about two years and which are located in three Middle Western states, the average use of electric service by each farmer connected was approximately 300 kw.-hr. per month. This indicates the possibilities of the use of electric service on the farm. Much time, money and effort are being spent on the experimental work under the supervision of agricultural colleges and committees on the relation of electricity to agriculture, and valuable new information is now available. The data collected from the experiments and conclusions drawn therefrom will be of little value to either the electrical or the agricultural industry unless they are used in a practical way.

Nineteen companies in thirteen different states have organized rural service departments which are closely following and receiving full benefits from the results of these experiments, and the rural service business of these companies is increasing rapidly. Your committee recommends that every electric service company give full recognition to the importance, magnitude and possibilities of this new development and, through the organization of special departments for the handling of this work, give it the special attention it deserves.

During 1925 there were added 236,000 customer stockholders, who provided over $297,500,000 for the construction needs of the industry. The total number of companies that have adopted this plan of raising junior money is now 226, serving a combined population of 75,000,000. Notwithstanding this splendid showing, it might have been better had it not been that some of the companies overlooked the many advantages of customer ownership other than that of raising money and, in view of the general demand, took the somewhat easier way by wholesaling securities. This committee, recognizing this tendency and the great importance to the industry of having the maximum possible number of its customers also stockholders, passed the following resolution, which is again commended to your earnest attention:

> We recommend to the customer-ownership committee that a notice be sent by that committee to the general membership, calling attention to the importance of the customer-ownership movement, with the recommendation of the public policy committee that the customer-ownership program should be carried on throughout the industry.

PUBLIC RELATIONS

The association is indebted to the Public Relations National Section for its work in 1925, which, if anything, surpasses the work of this section for any year since its creation at the Pasadena convention of 1921. The importance of the work of this section cannot be overestimated, as nothing is so vital to the success not only of the industry, but of the public itself, as a feeling of mutual understanding between them. All the committees of this section are entitled to commendation for their contributions to the general result.

The attention of executives is particularly called to that portion of the report of M. S. Sloan, chairman of the Public Relations National Section, concerning the seriousness of the work for the industry of this section and the necessity of all companies through their chief executives taking a very earnest and helpful interest therein. It has been well said that no matter how successful or how well financed a company may be, if it has not the favorable opinion of the public it serves it is in an extremely dangerous position. This is equally true of our industry as a whole. It is only by our constant endeavor, both locally and nationally, to bring the facts concerning our industry to the public mind, and by fair and honest treatment backed up by good service, that we can secure this favorable public opinion.

It is interesting to note the advance made during the year by the public speaking committee, which reports that there were approximately 10,000 talks on utility subjects made to an aggregate audience of approximately 1,500,000 people. While this is a considerable advance over the results obtained in previous years, when we consider that our industry enters into the life of even many of the smallest hamlets, it is nothing to what might be accomplished with the active co-operation of all company executives and the better training of selected employees, as recommended in the committee's report.

It is equally interesting to note that the women of the industry are doing their share of public speaking. Included among the various activities of the women's committee, as covered by its report, are several hundred addresses made by women in the various geographic divisions. Every division has now several good women speakers, and their number is being constantly augmented from the public speaking classes which the women have formed.

We are again indebted to the manufacturers for their great assistance in the industry's good-will advertising, which has done much toward that better understanding by the public of the industry and its problems.

AN UNDERDEVELOPED FIELD

The electric light and power industry is reaching a high stage of engineering and financial development. There are also some outstanding examples of fine business development, but taken as a whole the industry has not paid as much attention to its commercial expansion as apparently other lines of business consider necessary. A comprehensive investigation and study of the commercial problem, together with a study of the rate structures of all companies, seems very important at this time. Comparisons between companies might be made which should be of great value in arriving at conclusions as to whether one territory having the same general industrial and civic characteristics as another territory has been as well, or better, developed. Kilowatt-hours per capita is a fair measure of comparison if the character of the territory is well understood by those making the comparison.

We are all familiar with the outstanding job done by commercial executives in some other lines of large business. In the automobile business, for instance, the extensive and rapid growth is largely the result of marvelous sales effort led by a highly developed sales talent which thoroughly understands not only the economics of the business itself, but also the habits and purchasing power of the people with whom it comes in contact.

We need the same sort of commercial talent in the electric light and power industry, so that the industry may maintain in this branch of its work the same high standard of progress which has made it, as a whole, one of the outstanding industries of the country. Toward this end, your Commercial National Section, under the chairmanship of Past-president E. W. Lloyd, has during the past year contributed to the industry great assistance in its commercial development. We, therefore, call your special attention and interest to this branch of our business and the work of the Commercial National Section.

KEEP THE INDUSTRY'S HOUSE IN ORDER

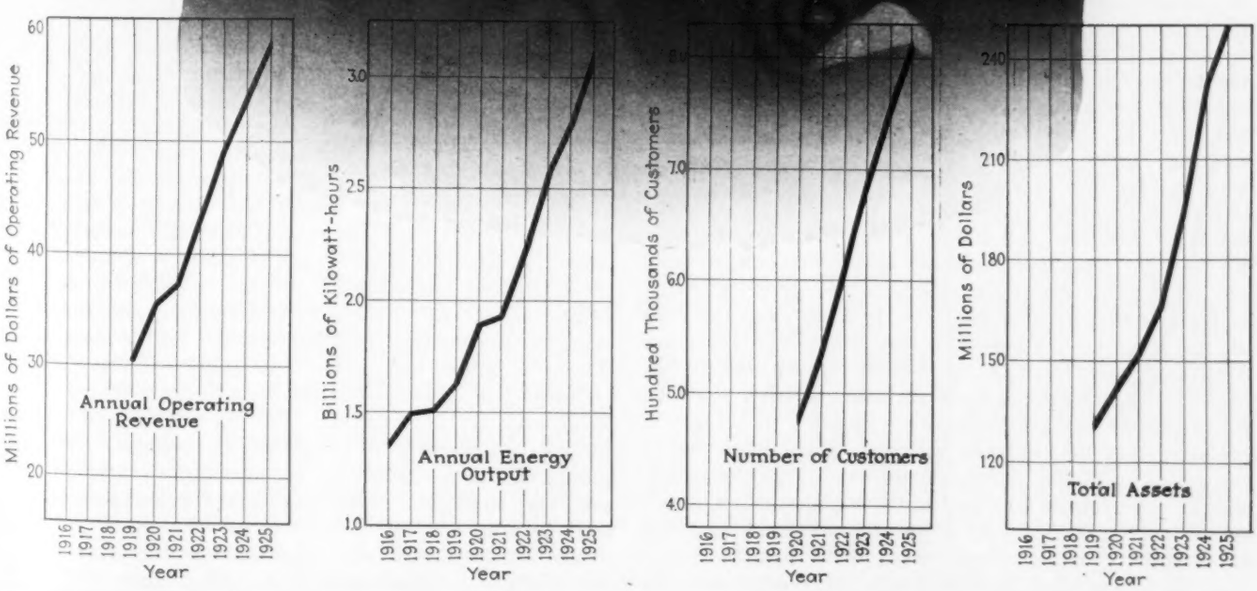
Since the World War our industry has made great strides. It has met with promptness the great increase of service demands made upon it by the public. Its securities have, on account of their proved stability, found greater favor than ever. It has been a period of great expansion, with new money comparatively easy to secure. It is necessary in times of prosperity to have in mind that there are times of depression. Sometimes it is well to stop, think and decide. It may be that the decision will be that the time has arrived when, for the advantage of our customers, our industry and the large army of investors which has made possible the great things the industry has accomplished, we should from now on devote more completely our energies to bringing into efficient, economical and fuller earning power the great developments of the past few years.

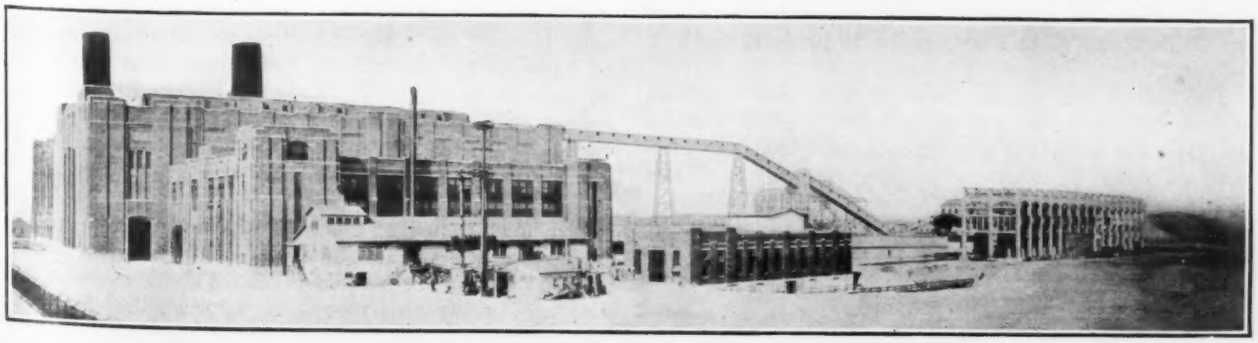
Commonwealth Edison Company Receives the

Coffin Award for 1926

THE largest metropolitan system in America received the 1926 Coffin award for meritorious public service when at the N.E.L.A. convention at Atlantic City this distinction was bestowed upon the Commonwealth Edison Company of Chicago. Customer ownership, public relations, commercial activities, engineering developments and industry co-operation were some aspects of service in which the company was held to excel.

THIS large utility company has more than 850,000 customers, a generating capacity of nearly 900,000 kva. and during 1925 produced more than 3,000,000,000 kw.-hr. of energy. The rapid growth of the company is attested by the curves in the accompanying charts. More meaning is attached to these curves when it is added that in the Chicago territory there is virtually 100 per cent utility service to all power users.





N.E.L.A. Policy and Practice*

Stirring Address of R. H. Ballard Calls Industry to Arms—Fight Socialism Through Education—Concentrate on Rural Service and Education as N.E.L.A. Goals—Policy Aims and Technical Work Outlined

OUR National Electric Light Association is two separate things: First, it is the voice of the electrical industry; second, it is a bureau for research, collection of statistics, interchange of ideas—an agency for the advance of the art itself.

These two fields are rather distinct. The first has to do with public policy. The second has to do with improving the technique of the art of generating, transporting, selling and distributing the commodity that we provide for the public electric service.

R. H. BALLARD

It is difficult to say which of these two fields is the more important. Without a sound public policy, improvements in the art would be of little advantage. Unless the art be constantly advancing, ever striving toward perfection, there would be small occasion for considering matters involving public policy. Perhaps we may say that the two fields are of equal importance and let it go at that. I shall try to review briefly what is being undertaken along each of these general lines of our association's activities and what we expect our continued progress may accomplish in each field. Perhaps it will be better to start with the question of public policy, for there are those in our country who seem to maintain that the electrical industry, alone among all of the activities of the nation, should have no public policy, should not attempt to contribute to the common good, should devote itself solely to the manufacture and sale of electricity without any attempt to benefit others (and incidentally to benefit itself) by contribution to sound economics, wise policies and correct vision, leaving all problems of this description to professional politicians.

The association, as you know, is not, never has been and we believe never will be in politics. Our association does not maintain any headquarters, does not even have an office in Washington, nor does it have any political bureau. It takes no part in the selection of candidates or in the election of men to office. It never will do these things. What, then, is public policy and how is public policy to be distinguished from politics?

Politics deals with electing men to office. Policies deal with the education of the masses of the nation (among which we include ourselves) to an appreciation of those sound economic principles that bring prosperity alike to individuals and to the nation. There is also involved the important task of informing the public, and of informing ourselves as one section of the public, of all of the pitfalls that lurk in those old economic heresies that have plagued the world since the beginning and that in spite of the lessons of experience are continually cropping up among us and are heralded each time as new discoveries of whatever little group of zealots may at the moment be conducting propaganda for some particular scheme.

Now how do we, and how shall we, handle matters of public policy? Like everything that the electrical industry of America does, its public policy is an open book. A committee, changing from time to time but always composed of real leaders of the industry, meets periodically to discuss and to decide policy problems. These meetings occur in New York, Chicago, New Orleans, Los Angeles, Portland—in fact in almost every large city of the country. To this public policy committee are submitted suggestions, perhaps from the public relations committee, perhaps from individual executives, wherever located, and often from our managing director.

The leaders who are to consider these problems are brought together around a table. They meet one another personally. They exchange opinions. They come to know one another as friends rather than merely by name or by reputation. Around the table questions of moment to the industry and to the country are discussed with the greatest frankness. Not one of the members is a "yes" man. All are individualists. Each one is a dominant personality who has reached his executive position through a process of natural selection over a long period of business experience that has included almost every sort of human contact. When a proposal gets by this body of hard-headed business men, each man having his own viewpoint, each holding his own

*Address of R. H. Ballard, "What Is the Function of the N. E. L. A.?" Atlantic City convention, May 18, 1926.

opinions and vigorously supporting them in debate, it is pretty certain that the policy is a sound one. Action is never narrowly geographical, for the members come from every section of the country. Decision is never from the viewpoint of a particular company, for companies of every sort, large, small, metropolitan or far flung over wide stretches of territory, are represented. In short, when the public policy committee speaks, it is the real voice of the electrical industry of America. That voice, with the gifted managing director of the association for its spokesman, never "pussyfoots," is never equivocal. It speaks only when the electrical industry is virtually unanimous. When it speaks, it speaks openly, publicly, positively, for the industry as a whole; always, we believe, it speaks also for the well-being of the nation.

Socialism Major Policy Topic

At present the major policy of our industry has to do with socialism. Socialism, like the single tax, is an ever-present menace to our people. So completely has the policy of socialism been discredited that almost never nowadays does the advocate of a socialistic scheme admit the name. Socialism today usually masks itself as something else. It is "public ownership," "government ownership," "municipal ownership," or, in even more instances, a particular scheme is advocated not as a part of a general program, but is put out under an apology. A man speaking for such a scheme will say, "I am against government ownership, *but*"—— Then he will go on to tell you why the peculiar conditions surrounding his scheme make it desirable that *for this one time only* right principles should be thrown into the discard.

Proposals of the kind just mentioned are the rule. If we could add together all of the schemes that in the last ten years have been presented to our people as "I do not believe in government ownership, *but*"——, we should find that all these schemes together cover nearly every major department of human activity. There have been proposals for government housing, government railroads, government marketing, government insurance, government telephones, government mines, government oil fields, government forests, government banks, government manufacturing and many others—almost everything, in fact, except the notion that the government should own all the farms of the country. The farmer is perhaps left out of the Utopia so that there will be some one on the outside on whom additional taxes can be loaded partly to offset the deficits in government revenue that would be caused by the issuance of an enormous volume of tax-exempt securities for these socialistic schemes.

No Secrecy About Stand

We are against this sort of thing on principle. There is no secret about our position. We do not believe in socialism—even less when it masquerades under some other name. We are as much opposed to socialism in the insurance business as to socialism in the electric business, or the mines, or the banks, or the department stores, or anything else. Government has its hands full when it sticks to government alone. In my own city of Los Angeles, where socialistic policies have already gone so far that candidates are selected and elections controlled by the powerful political machine affiliated with the Municipal Power Bureau, the streets, other than a few main boulevards, are in a wretched condition. A "letter to the editor" from a city a hundred miles away, the local problems of which have been tied in to the grandiose schemes of "public ownership" in Los Angeles, suggests that their next mayor might run on a platform of "Fewer chuck holes in Los Angeles streets." Professor Mavor in his "Niagara in Politics" tells how government ownership in Canada soon developed a political machine that, while dominating the province, "has contributed toward driving industry and intelligent organization either into the Province of Quebec or across the international line into the United States."

We don't want that sort of thing to happen in our country. Quite aside from the electric business, if the attack turns upon banks, for example, we as citizens do not want industry and intelligent organization either hampered or driven out by socialism. The recent history of Russia tells us all too plainly what socialistic policies bring.

Now, although it is comforting to be able to congratulate ourselves, self-criticism may be even more profitable. Are we doing anything we shouldn't do? Can we do more or better? To the first question we answer, No; to the second, Yes. How can we put more effective force behind our first function—that of promoting sound economic policies?

Co-operation Essential

We accomplish little in the modern world without co-operation. The history of the N.E.L.A. shows what can be accomplished by co-operation within the industry. Should we not consider whether the time has arrived for co-operation on a wider scale? After all, our major concern is national prosperity. If the nation prospers, we prosper. We are not alone in this; the same thing is true of every business and of each individual. Is there not some way in which as to public policy, and particularly as to socialism, whether disguised or undisguised, the voice of the electrical industry may carry more weight as one of several united voices than as a single voice?

And why not? As citizens we are as much concerned over any scheme to socialize the insurance business as over a scheme to socialize our own industry; but are we as active in our opposition to the one scheme as to the other? How, then, can we expect the insurance man to show more than a mild interest when the attack turns for the moment upon us? In short, should we not put more stress upon the principle, less upon the detail? If all business men in the land were thoroughly imbued with the fundamental principle that government ownership *in any field* is wrong, is socialistic, destroys democracy, brings an oligarchy into political power, then no local business man will back any scheme, however appealing in its local aspects, that violates the principle.

Every man of common sense will admit the principle, but many men fail to apply it. Even we, forced to study economics by the circumstance that one of the main attacks is upon us, frequently lose sight of the principle amid the forest of detail. How much more, then, our friends, who have not yet been seriously assaulted? Can we not, by shaping our public policy to pass over specific attacks, join with all other business groups as to fundamentals, thus playing our part in consolidating public opinion along sound economic lines?

The voice of our industry, already impressive, might, it seems to me, gain overwhelming force.

Turning now from policy to our second function, I see for the future an industry in which the smallest and most obscure company will be operated and managed along the high technical lines and in accordance with the soundest financial and business practices that may from time to time be developed by any member company. Our practice of technical, accounting and managerial committees, drawn from all parts of the country, insures that any company may, if it wishes, know exactly how the most efficient company does things. More than that, the constant research going on all the time among these specialized groups causes the high standards ever to be carried higher.

But I make a plea for the active support of these various activities on still more important grounds. Every general of an army knows that the intangible thing called morale has more to do with winning battles than any one of the other military requirements. The same thing holds in a business organization. In my judgment the effect of our various specialized group labors is even more useful in keeping our morale at high pitch than in those indispensable direct benefits that we see so clearly.

BEST MEN FOR COMMITTEES

You company executives are asked to select representatives to sit in on committee work. All of you name your best men. Some of you *send* your very best and most useful men. Others, when meeting time comes, feel that this or that man is so necessary at home that you cancel his attendance. Nevertheless, those who do participate find themselves associated with the keenest and most enthusiastic minds in their particular branch of the industry. Don't you all understand that after your representative has had two or three days of give and take with the best men in his own line in the country he cannot fail to return to you full of inspiration, to be a stimulant to the energy and vigor of all the rest? This is equally true if your practice is already the best of all—if your man gave to others but in return received only the gratification of having given a useful service. It is worth any temporary sacrifice that you should have your men really go to their meetings.

Again, is there one of us who does not realize with what pride and appreciation our younger men, who have not yet made reputations, welcome the opportunity to participate in association work, with what renewed energy they return to their routines—routines that cease to be routines and become inspirations? I put the importance of this stimulation of morale at the very top of the list of benefits.

SOME TANGIBLE RESULTS

Yet we cannot overlook the value of the more directly tangible things. To take but one example: On June 2, 1921, a special national committee on insurance was appointed. In its report dated Dec. 17 of the same year the committee announced that it had secured reductions in fire insurance rates on power houses and substations resulting in a saving to our members of $400,000 per annum, or more than the total N.E.L.A. dues of all companies for that year. That at least is tangible and specific and the dollar sign is on it. On July 31, 1924, reductions averaging 38 per cent were announced on casualty insurance. From time to time other and more special reductions have been secured. All of our association expenses are being balanced by the savings secured through the efforts of this one committee.

I do not give this illustration because it stands out in any manner as of greater actual value than the work of other groups but rather because its achievements appear directly with the dollar mark already put on. Actual accomplishments of other groups are equally valuable. If you want the names of such other groups I simply refer you to the bulletin of organization personnel. Put them all in, they all deserve it. Some accomplishments are more spectacular than others, but that does not mean that the others are of smaller value. Among groups whose work has come more especially to executive attention are the accounting group, the public relations group, and from the Technical Section, the inductive co-ordination committee. I do not need to give you details concerning these activities; you all know what has been done.

CONCENTRATE ON EDUCATION AND RURAL SERVICE

For the future we look for progress in every line but we regard two groups with a particularly lively anticipation. These are those touching on education and on rural electrification. The former ties in with public policy, the latter with the most immediately vital question before our industry. Speaking as an executive, I would say that the sectional committee work generally only needs our support and our co-operation. The educational and rural divisions, on the other hand, need, in addition, the best thought, the continuous thought, of the industry.

The human mind cannot think deeply on more than one subject at a time. Not many subjects, therefore, can in any one year receive the serious study of our executive representatives generally. I suggest the two major subjects just named as the ones that might to advantage be selected to receive our most constant and deepest study throughout the next few years.

In these two subjects the major functions of our association unite, since both are so closely related to public policy. The educational program must be all-inclusive. The problem of rural electric service has bound up in it the question of spread of rates, of whether we are to stick to the American plan of substantially uniform rate structures, or are to adopt the Ontario plan, so appealing to the socialist mind, of trying to find the separate cost of service to each locality, then for this locality charging for each class of service a rate inversely proportional to the number of voters in that class.

It may not be appreciated that the rural public still, in the long run, controls American policy. That situation may change, but it has not yet changed. If out of our labors we can find a way to make electricity generally available throughout rural territory, we shall come close to having solved the major problems that now confront us.

Our task for the future is to perfect ourselves in detail, through this association, to insure that each member company is kept up to the high standards of our best; then, with this background for deserving public support, to join forces with every sane thinking man and organized group, to make common sense a nation-wide policy.

Secretary Mellon Champions Private Initiative

Electricity Is the Power Behind Our National Prosperity — "Big Business" Is Vital to American Standards of Living

ANDREW J. MELLON, Secretary of the Treasury, addressed the convention by radio at the public policy session on Wednesday evening, complimenting the association on the part its member companies have played in increasing the wealth of America and in bringing about the far-reaching and beneficial economic changes of the past forty years. Industry organized by discovery and invention for mass production has raised the standard of civilization to the highest plane it has ever attained in the United States, now the wealthiest nation in the world, said Mr. Mellon. Here are the maximum income and the greatest degree of prosperity and well-being per capita to be found on the globe. The advance of science and the application of sound economic principles, combined with a growing concord between capital and labor, promise a bright future for American civilization.

"To produce express trains," Secretary Mellon went on, "automobiles, typewriters, textiles and electric power, business must be on a large scale, which implies the use of mass capital, or the combined savings of many men. Corporations are no longer owned by a small number of individuals. It has been estimated that the number of stockholders in this country exceeds nineteen million, many of them persons of small means who can obtain a better and surer return on their money when invested in some legal, well-operated corporation than in any other way. While the primary purpose of corporate organization is more efficient production of wealth for the owners, the corporation must also serve the welfare of society by operating with regard to the rights of the public, or else it meets with discipline and control on the part of the government.

"It is private initiative which is chiefly responsible for America's rapid growth in wealth. The foundation for her present development was laid in evolving a system which has given free play to the energy and initiative of the individual and at the same time has encouraged competition and has permitted corporate organizations in industry. Whether we shall continue to grow and expand depends upon whether we pursue an intelligent and constructive or a hostile and destructive policy toward those forces which have brought about our present development.

"It is necessary to have a clear conception of what those forces are. In the past our efforts to deal with them have consisted largely of sporadic attempts to regulate and sometimes to cripple industrial expansion without any recognition of the fact that those forces were not necessarily a menace. We are finding that large organizations not only stabilize production but frequently furnish the consumer with a standardized product at less cost than in any other way.

ANDREW J. MELLON
Secretary of the Treasury

"In any event, each business, whether great or small, must stand or fall on its own economic merits. The justification for big business is that it serves the public more efficiently than many small businesses could do in that particular line. President Coolidge has pursued a clear, consistent course and has made it plain that the administration will not interfere with legitimate business merely because it is big, but desires that business and industry shall as far as possible work out their own problems, provided they conform strictly to the law.

"In America pioneer conditions in industry have passed. We can no longer count solely on our boundless resources, but must depend on the increasing efficiency of our industrial system. Fortunately the steady growth of that system is being hindered less and less by conflicting economic interests based on geographical divisions, which years ago assumed the continuance of an industrial North and East and an agricultural South and West. The growth of the textile and iron and steel industries in the South and the automobile industry in the Middle West is sufficient indication that the same industrial processes are becoming common to all parts of the country.

"It is impossible to predict what the ultimate outcome will be, but it is not improbable that in time the spread of industrial development will eliminate the clash of economic interests along geographical lines and that class antagonism also will disappear as we find that our best interests are served, not by fighting each other, but by working together to build up a prosperity in which every one can share."

Home Making an Occupation*

Co-operative Movement of N.E.L.A. and General Federation of Women's Clubs Under Way to Relieve Home Workers—National Survey Brings Data and Shows the Way for Progress

MRS. JOHN D. SHERMAN

MORE than a year ago the General Federation, with the help of the National Electric Light Association, began to take stock of the housekeeping equipment in American homes. We sought your help because, as I said to you at your San Francisco convention, we couldn't make a nation-wide house-to-house canvass. We had to rely upon public utility records of service rendered to homes. But more important than all, we sought your help because we wanted to quicken the American woman's appreciation of the pivotal importance of public utilities to home making. You gave us the help we asked. You gave it and are still giving it with spendid effectiveness. Mr. Davidson, Mr. Aylesworth and Mr. Lloyd have given time and thought and counsel whenever we have asked them—and we have never hesitated to ask.

The filled-in questionnaires and the correspondence in our home equipment survey offices bristle with the daily evidence of the co-operation we are receiving from the local utilities officials throughout the length and breadth of the land. Of course, all this co-operation nationally and locally has cost you money too. What are the results at this writing of the work we undertook together a little more than a year ago? In the Washington Survey offices there is dependable, illuminating information concerning the utility-using facilities of more than 4,000,000 homes in 48 states. The approximately 2,000 communities covered by our information range from the small hamlet to the metropolitan cities. Before the closing date for the urban home equipment survey, which is May 31 of this year, the number of homes and communities covered will be even larger, as there are some states in which strenuous efforts are being made to go over the top of 100 per cent representation of club towns.

HOME EQUIPMENT SURVEY

In addition to the body of data on housekeeping facilities in town and city homes, there is in the General Federation's home equipment survey offices information concerning the equipment of about 20,000 farm homes in 35 states. As the rural home survey got under way in February of this year and as these questionnaires must be filled in from reports furnished by individual farm women to home demonstration agents or rural club leaders, we are deeply gratified at the returns thus far. The reports received during March and April and the first week in May covered an average of 2,500 farm homes a week.

INFORMATION ON HOME HABITS

But the collection of information is not the most important result of our survey, unexpectedly large as the volume of data has been and indispensable as it is for a basis of real improvement in home equipment. The interest aroused in the women home makers from coast to coast and border to border, and in the men too, is the most vitalizing product of the year's work. The news stories and editorial comments, which have reached by actual measurement into hundreds of columns since Jan. 1, have been neither solicited nor engineered. They have been spontaneous. They reflect the swelling, broadening current of thought cutting across and up and down the land. Thousands of earnest queries, urgent appeals, thoughtful comments, grateful and hopeful commendations are flowing into headquarters in letters or in notations on the schedules.

In the very few cases where the comments and queries have been critical it is usually because the home maker is unwittingly glorifying drudgery and ignoring its cruel waste of mother energy. One of the letters, exalting needless household drudgery in the place of intelligent devotion to family, I incorporated in one of my published discussions of the survey—and lo! the flood of answers from home makers, and from home makers as hard pressed as the devotee of drudgery—rendered needless my own efforts to point out the wasteful folly of spending the capital of mother energy in coolie labor when the children are young, leaving nothing for them to draw upon when they need that energy most. Only one of these answering comments shall I read here, for it is typical of the reaction which the women of the country as a whole are showing toward

*Abstract of address of Mrs. John Dickinson Sherman, president of the General Federation of Women's Clubs, Atlantic City, May 20, 1926.

the survey and its avowed purpose of eliminating needless household drudgery. The answers were aimed at one woman who glorified drudgery; who said that she had seven children; that she had no labor-saving devices except a sewing machine; that if she had an unexpected $300 to spend, she wouldn't put the money in better equipment but in books or a piano for the children; and who declared that she would go on spending her strength thus because she regarded it as her job "to hold her family up to the sunlight, even though her own feet were deep in the mire" of drudgery and poverty.

Home makers were deeply stirred by this letter written in a beautiful though mistaken spirit of devotion. Said one correspondent: "Tell Mrs. C. S. of Washington State to come out of her cherished mire and give her children a chance to share her burdens. . . . The children of today do not want to bask in the sunlight while their mothers are deep in the mire." Again: "I am teaching my children that electric appliances are necessities and not luxuries. I want my daughter to put a washing machine in the same class as a stove when setting up housekeeping, and if my son refuses to buy one before his first wedding anniversary, I shall consider myself a failure at raising children!" In another paragraph this pungent correspondent says: "I tell you, Mary Sherman, we women must be educated out of drudgery—forcibly pulled out if necessary."

Eliminate Drudgery in the Home

In the last sentence is the theme that dominates the uncounted letters and schedule comments flowing into General Federation headquarters. It is that this survey is the signal for an organized exodus of American home makers from the bondage of needless, household drudgery into the sovereign freedom of companionship and character building in family and community. This thought, set free by our survey and gaining momentum as it runs through the country, is the most vitally important product of the first year of the campaign, because it insures the continued growth of, and the ultimate fruitage from, our labors. So, in spending time, labor and money in giving the requested information to our local clubwomen, have you not rendered service as important as the material service you render daily when you light, or heat, or drive the water into the homes of a community? In my judgment you have, for you have helped to arouse the women home makers to a better understanding of the further service that the organized electrical and other physical energies can, and should, still render to loose the bonds of benumbing drudgery and to set free mother energies for their full measure of rightful service to home and family.

In this connection I was deeply interested to note that recently Dr. Edwin Slosson of Science Service and Dr. George Otis Smith of the Geological Survey called attention to the far-reaching economic importance of the extension of electrical refrigeration. Dr. George Otis Smith laid stress upon the significance of this labor saver and health conserver in the South, where ice has been a luxury confined to a very few. What the extension of the device will mean in the greater variety of foods made available to hot-climate homes can hardly be measured. And not alone to hot-climate homes is electricity bringing the labor-saving, health-building mechanical refrigeration but to the remote and often isolated farm homes of our great agricultural regions.

It is with particular gratification, therefore, that I note the efforts made by your industry to reduce the cost of the installation and operation of these mechanical refrigerators.

Aid on Rural Homes Sought

Among the many difficulties that I know must confront your industry—difficulties often created by efforts to convert purely engineering and scientific problems into political provender—I know that not the least are the obstacles in the way of serving efficiently the remote agricultural homes, where the transmission of electricity is sorely needed but is meagerly profitable, if it does not occasion an actual loss. But I am counting that you are going to find a solution for this problem as you have worked out other problems. I hope and expect, too, that the information we are now collecting, with the splendid help of the United States Department of Agriculture, concerning farm home equipment will be of service in solving some of the problems. As a member of the National Committee on the Relation of Electricity to Agriculture I hope to have a part with you in removing obstacles now standing in the way of the adequate electrification of the farm home.

Although the General Federation's program of activity in the interest of better equipped farm homes must wait upon the completion of the rural survey still under way, the work of the urban home can begin at once; for the vast body of information, even before its final analysis, is pointing to things that should be done now. Next week will begin our biennial convention in this city. I hope and expect that through the various conferences a definite program of follow-up work will be adopted.

Many Homes with No Conveniences

The information that has flowed into our home equipment survey offices in Washington has given us some real surprises. I had assumed, as have many of my associates, that in our urban centers all homes were supplied with running water and with what we regard as primary sanitary conveniences. I had assumed that these services had been put into the house many years before even the installation of electric light. In the very early stages of the survey, however, this assumption was shown not to be in accordance with the facts. In many towns and cities throughout the United States more homes are wired than are connected with running water. The surprise was not that so large a number were wired but that so large a number are without running water. I have been reliably informed that approximately 18,000,000 homes now have the blessing of electric light. But a double blessing lies in this fact: It is not only that there will be a continued improvement in the lighting systems of the home but that the same wire that brings light is available to correct the grave defect in running water connections in communities where waterworks installations or extensions are not feasible. In communities where waterworks exist we shall inaugurate campaigns based on the slogan: "The waterworks for every home."

To make the water bear its full burden of household labor we have to convince women that the water heater, the washing machine and all the other water-using, power-driven devices must be installed as fast as the income will permit and in the order of greatest labor-saving service rendered. Where gas is not available—

and I need not tell you that there are hundreds and hundreds of communities that have neither manufactured nor natural gas—we shall investigate and encourage wherever feasible the use of electricity for cooking and heating. We are going to ask business men to help us in this drive against needless drudgery not only by promoting an educational campaign but by making special rates and special terms for the devices shown by your information to be most needed in each community. I believe that in these campaigns your women's committees can be of great service if they will answer the call for information and help that may come to them from local clubwomen leading the movement for better equipped homes. Very often women not only do not understand the operation of the devices and the services such devices can render but are puzzled by rates and charged and deferred payments which the women's committees can help to make clear. In this connection I sincerely urge that the utilities men make their rates as simple and as understandable to the average housewife as possible. All these efforts will help to speed the movement toward better equipped homes.

DETAIL DATA NEEDED

Again: In too many places the records do not show enough detail concerning the facilities of home keeping to furnish a safe basis for a follow-up program of improvements. In these places we are going to ask your continued help to find the facts we need for guidance, for we are going upon the principle that we must begin improving with a sure knowledge of existing conditions. And right here I want to say that, although your records are in instances defective, they furnish, on the whole, a better and more detailed picture of service rendered the homes than do the records of older utilities. Furthermore, in some instances the work of supplementing local records is already under way because of the help of your member companies.

Quite appropriately the first big city to take the step is our capital and headquarters city, Washington, D. C. Through the splendid co-operation of William F. Ham, president of the Potomac Electric Power Company, a supplemental survey has been put under way this month under the auspices of the American Home Department of the district. One of the major lines of activity formally laid down this month in the program for the coming year's work by the entire District of Columbia Federation of Women's Clubs has for its object: "Modern facilities in all district homes to allow housekeepers to be home makers." The Twentieth Century Club of Potsdam, N. Y., not being able to find from the utility records the information needed, divided its town of 4,000 to 5,000 people into sections small enough so that club members were able to make a house-to-house canvass.

The Mayor of Dadeville, Ala., wrote me under date of May 3 thus:

> That we may give you a more intelligent answer to your questions [concerning home equipment] I shall ask the City Council at a meeting to be held on May 5 to appoint census takers to make an immediate survey of Dadeville; and I am sure that they will grant this request, and an answer sent to your office by the twentieth of the month.

From many other places have come evidence that the follow-up work is already under way. "We are using the information collected to get our start on home improvement work," writes one woman on her schedule. Says another: "The questionnaire has given us material for our program. It has been an education, giving us a new view of the relation of public utilities to home making," etc., all furnishing evidence that the interest is crystallizing into concrete activity.

I have told you enough, I think, to let you judge for yourself whether the results of our first year's work and our plans for the immediate future warrant your continued co-operation. Whatever your decision, I want to say not only that we appreciate deeply the help you have given us in getting started but that we are keenly aware of the splendid educational work you have done quite independently of us in your better lighting contest and in your continued and sorely needed effort to put into the homes, the schools, the offices, the mills and the workshops better light for the conservation of the nation's eyes. Should you decide to go further with us in our work, I am confident that the results of our combined efforts for better equipped homes will be clearly and gratifyingly apparent when the census facts for 1930 on home equipment can be compared with the information we have collected during the last year—for you know, do you not, that the General Federation has asked Congress formally to recognize home making as an occupation and to give us periodical information as to the prevailing facilities for the efficient performance of the occupation? With this officially collected, all-inclusive information to mark progress from period to period, what cannot be accomplished?

What Co-operation Accomplishes *in Home Making*

THE General Federation of Women's Clubs and the National Electric Light Association have recently joined hands to study conditions in American homes. A survey is under way to ascertain facts concerning existing housekeeping equipment, and plans are being made for a national movement to relieve homes from the drudgery and monotony so commonly encountered.

Already data on 4,000,000 homes in 48 states are on file in Washington at the headquarters of the General Federation of Women's Clubs. These data show tremendous possibilities for bettering home conditions.

This national movement for better home conditions deserves the hearty support and co-operation of all organizations.

Our Agricultural Plant Inefficient*

It Has Been Running Down Since 1900—Industrial Decentralization Advocated as a Remedy—Superpower for Decentralized Industries Aids Electrification of Farms—Place of the Electrical Industry in Rural Developments

GEN. GUY E. TRIPP

DURING the past 25 years the United States has, excepting for a few brief intervals, enjoyed exceptional prosperity. To mention merely three significant facts, our total national income increased within this period from $20,000,000,000 to $63,000,000,000, the earnings of individual industrial wage earners more than doubled and the standard of living of the average family rose to an unprecedented level. Indeed, if one studies almost any of the statistics relating to the United States as a whole since 1900, he will find progress and success pictured in the rosiest of colors.

But, unfortunately, total figures do not tell the whole story. Were we to dig a little deeper, we should discover, to our surprise perhaps, that a group comprising one-third of our citizens and representing America's greatest industry — namely, agriculture — has by no means shared in this general good fortune.

On the contrary, as shown by a comprehensive report on the agricultural situation recently completed after a most careful study by the expert statisticians and economists of the National Industrial Conference Board, our farmers have been struggling for the past 25 years with constantly increasing costs and no corresponding increase in prices (except for a brief period during the war); bankruptcies among them broke all records in 1924; the participation of the farming industry in the total income of the nation fell from 20 per cent in 1900 to 9 per cent in 1921; and in 1921 each person engaged in agriculture received only 43 cents for every dollar received by persons engaged in all other occupations. In a word, since 1900 our agricultural plant has been running down.

This is a serious matter. Compared with it, all of our other social, political and economic troubles seem to be relegated to second place. If our farming population is not prosperous, it will be discontented; and discontent among so large a number not only is unfortunate in itself but is bound in time to make itself felt in ways that will affect other more fortunate industries.

To remedy a trouble, we must first determine its true course. Why is agriculture out of step with other industries?

Many reasons are given, any or all of which may be factors in the situation; but among them the following seems to deserve special consideration:

The farmer must pay high prices for the things he buys, as indeed everybody else does, but because of these high costs he cannot sell his products with satisfactory profits in the world markets, where he must meet the competition of other countries where costs are lower, and in his home market he as an individual is confronted as to the bulk of his products by highly efficient organizations the guiding principle of which is to buy at the lowest price and to pass the benefits to the consumer. This is a natural and perfectly honest process, but to the farmer the picture is that most of our industries are so well organized that they are passing the heaviest burden of society on to him.

What is the remedy?

For the moment, the attention of our political leaders is directed to certain bills now before Congress. I shall, however, take the liberty of leaving them out of this discussion. Legislation is rarely a cure for economic ills. It has on occasion (as in the case of the Federal Reserve act) removed definite obstacles to the interplay of economic forces, but never have laws created prosperity where it does not exist, except by taking it away from others. We can, of course, bring a semblance of prosperity to the farmers by taxing all other classes of citizens for their support, but no permanent good could thus be secured, and much harm would certainly be done.

In presenting to you some views that appear to me to have some bearing on the solution of this problem in which superpower has a large influence, I should like to use New England of a generation or two ago as an illustration.

Though Nature has been somewhat niggardly with New England in matters of soil and climate, she was very generous in another respect—she scattered water

*Abstract of address, "Restoring the Balance Between Industry and Agriculture," delivered before the N.E.L.A. convention, May 20, 1926.

powers with a lavish hand throughout this district. Many of these water powers were put to work at an early period and, as a result, most of New England farms of 60 years ago lay within reach of some busy little industrial center.

The farmer took his wheat to the local grist mill, his calves to the local slaughterhouse and his wool to the local cording mill, and had his raw materials turned into usable goods on the spot. He bought his cart from the local wagonworks and his churn from the local wood-working factory. And not only did these establishments supply his material wants but they provided a market for his products and also gave employment to those of his sons and daughters who, for one reason or another, were not engaged in farm work, and in addition, offered him employment during the slack periods of his own highly seasonable occupation. Thus the typical rural community of New England at that time was largely self-contained and economically independent of the rest of the world.

But the wheel turned. Improvements in railway transportation and the increasing efficiency of large industrial plants closed down the little local industries. The farmer suddenly found that he was no longer self-sufficient. To fill many of his wants he now had to buy the products of outside manufacturers, and to get the money for this purpose he had to sell his own products in a country-wide and a world-wide market. Then the machine that exalted manufacturing and commerce and depressed agriculture got started and, as a crowning misfortune, his children and his best workers, attracted by the high wages and diversions of the industrial cities, left the farm.

But the wheel is showing signs of making another turn. The centralization of industry has apparently gone too far.

Take, for example, a large industrial city that contains scores of factories and employs thousands of people. As these factories grow, congestion increases until a point is finally reached when newcomers find it impossible to obtain satisfactory homes in the city itself except at prohibitive prices, and the transportation facilities from outlying points become intolerably overcrowded. Wages, therefore, begin to increase, but without benefiting the wage earners, because their expenses likewise increase.

Under these circumstances considerable economies for both industry and wage earner can be secured by establishing relatively small unit plants in the small towns of the rural districts. Not only are new sources of labor thus opened up, but production costs can be reduced, certain managerial difficulties can be minimized, and the workers can live comfortably and more inexpensively within easy reach of the plant.

Although labor conditions form the most important factor favoring decentralization, others are also influential, such as the reduction in rent and taxes, nearness to sources of raw material, and so on.

How Superpower Aids Decentralization

Furthermore, decentralization of industry will help the farmer in another and quite different way.

Electric superpower systems are vital to industrial decentralization. Without these systems, industries will not spread out into the country, regardless of advantages to be secured by doing so, but will remain in congested centers. But wherever superpower systems are well developed, power can be secured almost anywhere. Hence, as superpower systems grow, small factories will multiply in the rural districts.

Now, the chief obstacle to the electrification of our farms is the high cost of bringing electric service to them. It usually does not pay to tap a high-tension line and build a low-tension line to take care of the relatively small demand of a few scattered farms, but it frequently does pay to do these things to serve an industry; and when once a service connection is made and a line is built, neighboring farms can then be supplied with electric power at a reasonable cost. Hence, as small factories multiply in the rural districts, more and more farms will be electrified.

No one questions the great value of electric power to the farmer. Give the farmer electric power at a reasonable cost, and he can immediately relieve himself and his family of a large portion of their burden of labor, reduce his costs, make his profits more certain, and, what is of equal importance, raise his standard of living to a level corresponding to that of the city dweller, which will improve the morale of his family, help to keep his children at home and make it more easy for him to secure efficient labor when he needs it.

To sum up, the decentralization of industry will enable the farmer to broaden the earning capacity of his family, increase the business value of his farm and make his home more attractive. It appears, indeed, to be the most promising, if not the only practical influence that will bring agriculture back into step with other American industries and restore prosperity to it. If this can be done, it will mean the elimination of discontent and radicalism from a large and influential proportion of our population, thereby greatly strengthening the political and economic structure.

Electrical Leaders Must Guide

But all of this is dependent upon electrical development, and electrical development is dependent upon the wisdom of the leaders of the electric power industry.

These leaders, therefore, bear a heavy responsibility. To them the country must look for a development that will bring about a great social and economic readjustment. So much is involved in the electrification of the rural districts—it means so much to industry, to the farmer and to the nation as a whole—that this undertaking may be regarded as the primary duty of the electric power industry. Here, indeed, lies the present frontier of electric progress.

But if the people expect these things of the leaders of the electrical industry, it must also realize that no one else is so competent to accomplish them. Only men of the widest knowledge and experience in electrical matters, skilled in creative work and guided at every step by economic considerations, can succeed.

No government body—state or federal—can do it effectively. The driving force of all government effort is political expediency, and political expediency is a poor tool when applied to economic problems.

The American people have so far refused to permit their public utilities to be conducted in this manner, and though the advocates of public ownership, when they begin to realize the immense national value of rural electrification, will probably renew agitation for government ownership and administration, it is highly probable they will continue to receive scant public support.

Economics of Electricity Supply*

Survey of National Situation Demands Greater Sales Efforts —Markets Are Available and the Industry Situation Calls for a Development Program—Interconnection Possibilities

By SAMUEL INSULL
President Commonwealth Edison Company

IN THE development of an industry, as in building a house or an airplane, symmetry and balance are of practical value. Unbalanced development may unfavorably affect an industry's prosperity and retard its growth. From this viewpoint there are circumstances and tendencies in the electric light and power industry which invite thoughtful consideration.

These circumstances are not alarming as yet, but the time to consider them is before they become serious. This is the more desirable because the rapid growth of the industry and the high degree of prosperity it enjoys tend to make the people in it think that all is going as well as could be. No industry is going as well as it should while there is room for improvement. In drawing attention to some of these circumstances the statements made and figures used apply to the whole country, unless otherwise specified.

Output Lags Behind Investment

Sales of electrical energy in the United States, or output in kilowatt-hours, are not keeping pace with the increasing investment in plant and equipment and are not keeping pace with the increase in generating capacity. This discrepancy may be only temporary. It is probably not yet sufficiently acute to affect the balance sheets of the conservatively financed and well-managed companies. But it seems plain enough to invite attention. The circumstances suggest that a growing need of the electric light and power industry, as a business, is increased sales of kilowatt-hours in the various classes of business on our lines.

Gratifying results have been achieved on one side of the industry—that is, in the development of generating apparatus, in station building and in the general application of mass-production principles. In spite of the mounting cost of all kinds of electrical equipment, the average investment cost per kilowatt of generating capacity steadily declined until last year, when it advanced slightly. From 1912 to 1925 the total generating capacity of the country, according to the best available figures, increased a little over 320 per cent, while the total investment in plant and equipment, including distribution lines, increased only 194 per cent. During this period the average investment per kilowatt of generating capacity was reduced from $425 per kilowatt in 1912 to $294 in 1923, or more than 30 per cent. The average remained at $294 in 1924 and advanced to $297 of investment per kilowatt in 1925.

The ratio of kilowatt-hours output to the total investment and the ratio of output to total generating capacity are another story. Between 1912 and 1923 the average of kilowatt-hours generated per dollar of investment was nearly doubled. It increased from 5,340 kw.-hr. in 1912 to 10,000 kw.-hr. in 1923. In the following year, 1924, this average dropped from 10,000 kw.-hr. to 9,450 kw.-hr., or 5½ per cent, and in 1925 there was a further drop to an average of 9,300 kw.-hr. generated per dollar of investment—a decline of 7 per cent in the last two years.

This decline in kilowatt-hours per dollar of investment is the more significant when it is recalled that it has taken place in the same years—1924 and 1925—when the average of investment per kilowatt of capacity was practically at its lowest. If the average output were only holding its own in proportion to capacity, a reduction in the investment per kilowatt of capacity should automatically increase the average of output per dollar of investment. On the contrary, it has declined, indicating that the industry as a whole is not expanding and increasing its business as fast as it should.

The obvious conclusion from the foregoing appears to be confirmed when the figures on kilowatt-hours generated in proportion to kilowatt of capacity are examined. In 1912 the average of kilowatt-hours generated per kilowatt of capacity was 2,240. By 1917 this average had become 2,820 kw.-hr. generated per kilowatt of capacity, an increase of approximately 26 per cent. Five years later, in 1922, the average of kilowatt-hours generated per kilowatt of capacity was still 2,820, but it dropped to 2,450 kw.-hr. in 1923 and to 2,410 kw.-hr. in 1924. It recovered a little in 1925 to an average of 2,440 kw.-hr. per kilowatt of capacity, but it was still 13 per cent less than the average three years earlier, in 1922.

Some years ago, during and immediately after the war, the industry as a whole lacked adequate reserve capacity, but any deficiency in reserve should have been supplied by 1922. Increase of capacity to provide proper reserve is hardly an adequate explanation of the lower average of kilowatt-hours generated per kilowatt of capacity during the last three years. This would seem to corroborate the condition indicated by the decline in output per dollar of investment.

Residential Sales Below Possibilities

Sales of electrical energy in many localities are obviously far below what they ought to be. This must be so, since the figures already given on the decline in average output per kilowatt of capacity and per dollar of investment include localities where output has been away above the average. Investigation indicates that sales to residential customers the country over average

*Address made at N.E.L.A. convention, Atlantic City, May 20.

only about 360 kw.-hr. per annum. This is very low considering the possibilities, especially in industrial areas, and there is no sign that the average is being increased.

If it be argued that our figures on residential business exclusively are not complete enough to be conclusive, let us examine some others that are comprehensive, namely, the figures on the lighting load of the industry. These figures include all residential customers and also include the large industrial and commercial lighting customers, which brings the averages much higher than they would be for residential customers only.

In 1914 the kilowatt-hours sold in the United States per lighting customer averaged 674 per annum. By 1923 this average had risen to 941 per annum per lighting customer, or an increase of 39.5 per cent. The average dropped in 1924 to 906 kw.-hr. per annum per lighting customer, and to 854 kw.-hr. in 1925, or 10 per cent less than the average for 1923. It may be argued that the small residence customers have been increasing faster than the large commercial lighting customers, but this does not alter the fact that all lighting business per customer has fallen off.

Per Capita Output Varies Largely

Opportunities for great increases in the total electrical business of the country are indicated by examination of figures on particular districts. As between districts in which opportunities would seem to be much alike, there is a wide variation in the per capita output. Ten such large-city districts have been analyzed on the basis of the 1924 figures, the latest ones available for all of them. The districts are Baltimore, Boston, Chicago, Cincinnati, Cleveland, Detroit Milwaukee, New York, Philadelphia and Pittsburgh.

In three of these districts the output per capita in 1924 ranged from 840 kw.-hr. to 890 kw.-hr. per annum. In four of them it ranged from 705 kw.-hr. to 785 kw.-hr. per annum. In two it was respectively 615 kw.-hr. and 675 kw.-hr. per capita per annum. In one it was 595 kw.-hr. per capita per annum. In the Chicago district, which includes a great expanse of urban and suburban and semi-rural residential territory, as well as the industrial area around the southern end of Lake Michigan, the per capita net output of energy for all purposes has been almost doubled in ten years and amounted to 935 kw.-hr. per capita in 1925. Excluding energy used for elevated and surface car transportation, the per capita output in the Chicago district has been more than multiplied by three in the ten years; it has been increased from 230 kw.-hr. to 720 kw.-hr. per capita per annum in that time.

Opportunities in Residential Business

Now, take the residential situation again. It is estimated that we have 14,500,000 residential customers in the United States and their average use of electricity is 360 kw.-hr. per customer per annum. The average use by residential customers in Chicago is 500 kw.-hr. per annum, and this is by no means the highest in the country. If the average use by the 14,500,000 residential customers were brought up to the residential average in Chicago, the increased consumption for the country would be over two billion kilowatt-hours, yielding about a hundred million dollars of additional annual revenue.

When there is such variation in per capita consumption, it must be that great opportunities for increases exist elsewhere. These opportunities are to be utilized by systematic campaigning for new business, combined with proper attention to rate systems. Effort along this line will bring up the sales per kilowatt of capacity and per dollar of investment, as well as improve the load factor, with consequent favorable effect upon balance sheets and net return.

Take the one item of domestic appliances. According to the latest available estimates, the earnings on energy supplied to operate domestic appliances amounted in 1924 to $109,000,000. This was 8 per cent of the total electricity earnings of the entire industry and 62 per cent of dividends paid by the industry that year. It was practically all clear additional income, with almost no corresponding increase in expense except the cost of coal for generating the energy absorbed by the appliances. This income can probably be doubled or tripled with practically no increased expense except the cost of selling appliances.

The intimate relationship between rates and use of energy by residential customers, with possible improvement in load factor as residential business grows, is reflected in a residential survey of 226 central-station companies. These companies served about 6,500,000 customers in a population of a little over 27,000,000. For the fifteen companies having the highest rates, which ranged from 13.1 cents to 18 cents per kilowatt-hour, there was an average residential consumption of only 194 kw.-hr. per customer per annum. Twenty-seven companies whose rates were 7.1 cents to 8 cents per kilowatt-hour had an average residential consumption of 339 kw.-hr. per customer per annum. So it went through the 226 companies; as the rate went down the residential consumption increased until it reached an average of 1,171 kw.-hr. per customer per annum for three companies having rates ranging from 1 cent to 3 cents per kilowatt-hour. The companies with materially low residential rates had the better balance sheets, better public relations and altogether were in a healthier condition.

An Economic Phase of Interconnection

The increasing importance of the holding company in the industry suggests that its relation to the economics of the industry should receive more attention. If this relationship is as well understood as it should be, there is a lack in the application of the understanding to the every-day economics of the industry.

Ten companies serving concentrated areas and ten companies serving widespread areas have been studied over a period of several years and compared as to the maximum load, kilowatt-hours generated and load factor. There is not much difference between these two groups of companies in respect to maximum load or kilowatt-hours generated. Over a nine-year period the concentrated-area companies have increased their maximum load considerably more than the others and have increased their output a little more.

The significant difference between the groups is in load factor. In 1917 the concentrated-area companies had a combined or average load factor of 45 per cent and by 1925 had improved it to 47.2 per cent. The widespread-area companies had a load factor of 56.8 per cent in 1917 and in 1925 had advanced it to 60.5

per cent. Neither group showed much improvement in load factor, but the widespread-area companies did the better. They had a better load factor by nearly 12 per cent to start with and improved it by 3.7 per cent, while the concentrated-area companies were improving theirs by 2.2 per cent.

The obvious deduction is that if the ten companies were more closely interconnected for a free interchange of energy, both would have been materially helped. When two companies operate in the same general geographic area or in adjacent territories, the fundamental economics of the business decree that they should be interconnected for mutual advantage, with their agreements drawn to encourage the building of highly economical base-load plants.

Interconnection is making progress. The thing to be desired is more progress. When this is advised by one from the Mississippi Valley it is not a matter of just preaching. In that part of the country interconnection is continuous policy and practice. In the Mississippi Valley interconnected systems operated by fourteen large interests or groups have two-thirds of the customers and 85 per cent of the earnings and are supplying more than 90 per cent of the output.

This territory includes the longest transmission interconnection in the world, all of it over the lines of the same interests. This interconnection runs from the water powers of central Wisconsin through the great load center of the Chicago district, down by the mine-mouth plants of central Indiana, and then through southern Indiana to the Ohio River, tying in with the steam station and the water power being developed at Louisville; then on south 70 miles to the high-head storage water power of Dix River and on through to the mine-mouth steam plant in the high-grade coal fields of Virginia—a total distance of 730 miles.

WISCONSIN-VIRGINIA SUPERPOWER LINE

This is all over high-class 66,000-volt or 132,000-volt, mostly steel-tower transmission, excepting for 50 miles in northern Illinois, 65 miles from Aetna to Monticello, Ind., and 30 miles from Sullivan to Edwardsport, between which points the lines are 33,000-volt with wooden poles. This example of transmission over long distances is rapidly becoming, for economic reasons, a superpower high-voltage line through from Wisconsin to Virginia. The reasons which are bringing about such a line will serve as a good example to bring out the underlying economic principles involved in this great question of interconnection and superpower. These reasons are:

(a) Protection of continuity of service.

(b) Diversity of load and territory, resulting in improvement of load factor and conservation of capital.

(c) Diversity of generating supply—storage water power, run-of-the-river water power, mine-mouth steam plants and steam plants at large load centers.

(d) Pooling of reserve capacity, which reduces the amount of reserve necessary for equal protection, thus conserving capital.

(e) Relaying of power in case of drought, high water, breakdowns and other abnormal conditions.

(f) Economies in operation and conservation of coal through better distribution of load on the more economical stations.

Another detail that might well repay thorough examination, and one that may contain economic advantages far beyond anything now realized. is the possibility of interchanging power with large industrial institutions which have considerable electrical generating capacity. Of these the basic steel mills are an example.

The large steel companies have not yet freely admitted that they can advantageously interchange energy with local utilities. Perhaps pride of position has been a deterrent. Until recently the steel companies in many instances have been financially larger enterprises than the utilities. If this has been a deterrent, the consolidation of electrical enterprises, as an economic consequence of interconnection, should tend to correct it. Anyhow, the electrical industry need not wait for the other side to realize the situation and the opportunity. It is up to electrical men to make the first move and educate the others to the economic possibilities of the situation.

ELECTRICITY, GAS, COKE AND STEEL

The place of the manufactured-gas industry in this general economic situation invites more study than has yet been given to it. This concerns not only the companies in the areas of concentrated steel production, but the companies in immense areas of adjacent or tributary territory. Things are happening that, if definitely studied, may be found to be of great significance.

The center of population in the United States has moved to the western edge of Ohio. The center of steel production was at the eastern edge of Ohio in 1904, and twenty years later, in 1924, had moved to the center of Ohio. With "Pittsburgh plus" abolished and with waterway improvements in the Mississippi Valley coming along, the migration of the center of steel production much farther west can easily be expected. This suggests a great field for the economic development of the electricity supply business in cooperation with the gas, coke, iron and steel industries.

The elements of the situation are exemplified in the Chicago industrial area adjacent to the southern end of Lake Michigan. The five largest steel-producing districts of the world, in the order of their production, are: the Pittsburgh district, the Ruhr Valley, the Calumet district (a part of the Chicago industrial area), the Mahoning Valley and the English steel belt.

The elimination of "Pittsburgh plus" will certainly move the Calumet district into second place. It is conceivable that Calumet may even take first place in time. The steel mills of the Calumet district have a combined electrical generating capacity of approximately 300,000 kw. The utility companies are supplying in that district only about 35,000 kw. With proper economic interchange of power, the local utility companies should be supplying about 100,000 kw. of the total.

Forty-three blast furnaces in the district produce, when in full operation, 3,000,000,000 cu.ft. of lean gas (96 B.t.u.) every twenty-four hours. Most of this is used in making and finishing steel. But from 39 of the blast furnaces, when operating at full capacity, there is enough lean gas wasted over week ends to produce 50,000 kw. of electrical energy. Fifteen hundred coke ovens in the Calumet district produce 162,000,000 cu.ft. of rich gas (550 B.t.u.) every twenty-four hours, which just about equals the combined gas production of the three local gas companies of the Chicago area. Steel companies use most of this rich gas. Local gas

companies purchase a part of it. But about 60 per cent of this rich gas is still wasted over week ends, in addition to the waste of lean gas already referred to.

INVITING FIELD FOR RESEARCH

The situation is an inviting one for study in the conservation of energy now wasted and in the economic interchange of energy or its fuel equivalent. It suggests that expansion of the electrical, the gas, the coke and the steel industries should go hand in hand to realize the best economic conditions and the conservation of fuel and energy.

It may not be out of place to draw attention to another subject which our electricity supply companies and our friends in the gas business might well pay close attention to, namely, low-temperature carbonization of fuel. It is well worth our while to spend money on research in this field. To those who may be fortunate enough to solve the problem the reward will be great. That the solution will be found within a comparatively few years, I have no doubt.

It seems to me safe to predict that ere long electricity supply companies and gas companies will produce electrical energy and gas, to say nothing of valuable by-products, under the same roof, from one plant, and from using one class of fuel.

The power requirements of the United States, as they exist today, are only a little more than half supplied electrically. The total of primary power installed in the United States is put at 70,285,100 hp., divided as follows: Electric (including electricity supply stations, electric railways, privately owned plants and isolated farm plants), 38,757,300 hp.; non-electric (including manufacturing plants, mines and quarries and stationary farm power), 31,527,800 hp. The non-electric power already installed is divided as follows: In manufacturing plants, 13,367,900 hp.; in mines and quarries, 3,859,900 hp.; on farms (stationary), 14,300,000 hp.

POTENTIAL FARM AND RAILROAD MARKETS

Sixty-four per cent of the farms of the United States have telephones. Automobiles are owned on 55 per cent of the farms. Only 7.8 per cent of the farms have electric service of any kind. But 47 per cent of the farms have some kind of stationary power already installed. If this installed farm power were electrified, it is estimated that the resultant consumption of energy would amount to 3,500,000,000 kw.-hr. per year.

Assuming the feasibility of electrification for the remaining 53 per cent of farms, it is estimated that the aggregate farm power needs of the country would absorb 7,450,000,000 kw.-hr. of energy per year. Assuming that 80 per cent of the farms would then use electric light, that 50 per cent would cook electrically and that 50 per cent would use electric refrigeration, additional annual consumption is estimated as follows: For farm lighting, 2,570,000,000 kw.-hr.; for farm cooking, 6,770,000,000 kw.-hr.; for farm refrigeration, 1,910,000,000 kw.-hr.

Estimating in this fashion forecasts the potential farm market for electrical energy at 18,700,000,000 kw.-hr. per year, or consumption equal to 29 per cent of the present total kilowatt-hour output for the whole country. The estimated maximum load would be 4,740,000 kw. and the load factor 45 per cent.

Only about 1 per cent of the country's 250,000 miles of steam railroad is electrified. The railroads burned in 1924 (the last year for which figures are available) 210,000,000 tons of coal. If completely electrified, the railroads would use 40,000,000,000 kw.-hr. of energy per year, with a maximum load of 10,000,000 kw. If this energy were all supplied by coal-burning electric central stations, the annual saving would be 136,000,000 tons of coal. If one-third of it were supplied by hydroelectric stations, the annual saving would be 162,000,000 tons of coal.

TOTAL CENTRAL-STATION POSSIBILITIES

On the basis of the foregoing estimates, only 47 per cent of the total potential market for electrical energy in the United States is now electrically supplied. Central stations are supplying only 38.2 per cent of the estimated possible total, isolated industrial plants supply 8.2 per cent of it, and isolated farm plants supply 0.6 per cent.

Manufacturing, mines and quarries, it is estimated, would absorb 18.2 per cent of the possible total, steam railroads would absorb 23.6 per cent, and farm use would absorb 11 per cent. These estimates are based on requirements for manufacturing, for mines and quarries, for railroads and for farms as they exist today, and without any allowance for increased demand on account of growth in population, higher standards in lighting, increased use of appliances or otherwise. These figures on potential outlets for power indicate the existence of an enormous market without waiting for the ultimate possibilities in railroad and farm electrification.

How can we best correct our deficiencies and make the most of our opportunities? In general terms, the answer is, by more aggressive selling of energy and appliances. At the risk of repetition let me summarize in more detail.

First, we shall gain by the interconnection of all systems, large or small. Generating stations of highest economy should be connected to the load centers of all adjacent systems by high-tension lines. High-economy generating stations should be connected with all other such stations in adjacent territory. The results will be: (a) Improved load factor; (b) lower operating cost by throwing base loads on the most economical stations; (c) lower investment cost by dispensing with reserve capacity; (d) greater assurance of continuity of service.

Second, we shall gain by expenditure on research work, not only for the discovery of new methods, but also in the study of selling prices and rate structures, with a view to getting the greatest quantity consumption of product under the most favorable conditions of load factor.

Third, we shall gain by the closest co-operation with the manufacturers and distributors of all kinds of energy-consuming devices.

Fourth, we shall gain by employment of the highest class of engineering talent in the sales departments of operating companies.

Such a policy will increase our sales of energy per customer, will reduce our investment per kilowatt of demand, will reduce the delivered cost of our energy, will improve our load factor, will assure continuity of service, will improve our relations with our customers, the public, and will give greater returns to our owners, the stockholders.

Electricity in the Home

Present Domestic Utilization of Electrical Energy Indicates Less than 50 per Cent of Saturation—Seven Million Residence Customers Added to Lines in 1925—Disregarding New Construction Twelve Million Homes Remain Unwired

M. LUCKIESH

THE report of the committee on electricity in the home, M. Luckiesh chairman, was a very comprehensive survey of the present conditions and future possibilities of the domestic utilization of electricity.

Of the total electrical energy generated, 9 per cent is used in the home, but this small part of the total generated provides approximately 28 per cent of the total revenue of electrical energy in all fields of utilization. On a basis of purely utilitarian requirements, the average home has been found to be far from saturation electrically. A 50 per cent increase in consumption of electrical energy is estimated from lighting by incorporating the conservative standards of wiring and lighting set forth in previous reports of the committee. This first step in the lighting development of the home would increase the total residential lighting revenue to a value equal to 36 per cent of the total central-station revenue.

Saturation points of the medium-priced appliances, such as the iron, vacuum cleaner, toaster, etc., are goals still far distant. At present the home contains an average of 2.1 appliances based on the best recent survey. These appliances consume an average of 66 kw.-hr. per year per customer. Saturation of the sale of appliances will provide profitable increases in the use of electrical energy.

PRESENT AND POSSIBLE REVENUE

During the last five years more than 7,000,000 residential consumers have been added to the central-station line. The majority of these have been wired and lighted to levels only slightly better than previously wired homes. New homes are far better prospects for convenient and adequate electrical equipment than are the existing homes, for higher standards are obtained more readily and at less expense to the customer. Likewise the sales expense to the electrical industry is less, for a large part of the work that would have to be done later by repeated campaigns can be accomplished with one concentrated effort. During the last few years increasing interest in the residential customer has been evident, and wherever intensive campaigns have been conducted, large increase in revenue have been obtained.

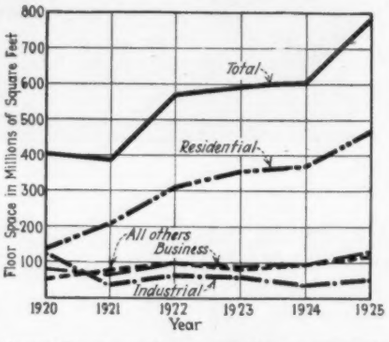
Lighting now occupies an enviable position as a revenue producer for the central station. Sixty-seven per cent of the central station revenue comes from lighting and lighting consumes only one-fourth of the electrical energy. During the last five years this general average ratio of energy to revenue has been maintained, and in 1925 residential lighting alone returned 28 per cent of the total revenue to the central station. The average residential customer uses 386 kw.-hr. per year, for which he pays $30. These figures represent the average of 235 cities, of which *Electrical Merchandising* procured information on 115 and the committee on 120. This 28 per cent of the total revenue must be ascribed to homes inadequately equipped with lighting and domestic appliances, and it is estimated that if all of the homes now using electrical energy were brought up to the conservative ideal of electrical utilization, the annual domestic consumption would be increased by about 50 per cent and the annual revenue increased more than $200,000,000.

That the home is a lucrative field for the sale of electrical energy and equipment is evidenced by the inadequacy of the present distribution of equipment and the extensiveness of the field. The number of residential customers at the beginning of 1926 is placed at 14,532,930, an increase of more than 1,000,000 during 1925. Recent surveys have revealed that the home field is far from saturation in both lighting and appliance equipment. In terms of a standard such as the conservative ideal that was designed primarily for only convenience and adequacy, all of the major items of home electrical equipment are now at or less than 50 per cent of saturation.

The increase in annual revenue from the sale of energy by saturating the field for certain types of appliances is shown in the accompanying table, as is also the increase in annual revenue by making certain additions to the lighting load. In reference to domestic lighting, it is interesting to note that of the combined purchases of electrical utilization equipment, residen-

tial lighting fixtures are about one-quarter of the total.

As a basis for comparing the home field with other fields the graph shows building floor space contracted for in 27 Northeastern states as compiled and grouped by the F. W. Dodge Corporation. These 27 states represent 71.5 per cent of the population of the country and represent nearly 75 per cent of various items of building for the country. Residential building accounts for more than half of the total floor space contracted for and represents nearly one-half of the money invested in new buildings. Building in the residential field has been very active in the last five years and authorities quite well agree that building activities for 1926 will not equal that of 1925, but there is a difference of opinion as to the extent of the decline. It is believed that our natural growth will maintain our building activity to 90 per cent of that of 1925, although some economists say a 25 per cent reduction is probable. The residential building field is not saturated—in fact, an actual shortage exists in certain types of buildings and localities, as is indicated in the survey conducted by *Building Age*. Quoting from the report, the greatest lack at present appears to be for moderate-priced homes, the survey indicating that more than 200,000 homes costing less than $5,000 and 100,000 homes costing from $5,000 to $10,000 are needed. It is furthermore apparent in the returns from the 590 cities and towns that the most considerable building shortage exists in cities with a population of between 25,000 and 75,000. In addition to development work in the present wired homes and the homes being built each year, there remain 5,000,000 unwired homes within easy reach of central-station service, and after these come 7,000,000 unwired homes that are at present outside of central-station service territory.



FLOOR SPACE IN BUILDINGS CONTRACTED FOR IN 27 NORTHEASTERN STATES IN THE LAST SIX YEARS

The present wired home is not only lacking in quantity but in quality of equipment. A survey of homes reveals that 31 per cent of the ceiling fixtures were unquestionably obsolete. This figure is extremely conservative and represents only in part the potential replacement of fixtures possible in homes today.

The results of recent surveys in representative homes in residence communities emphasize the need of instructions for the householder when equipping the home electrically, and indeed on all sides there are examples of the unconcern with which the householder regards the lighting as compared with his attitude of attention toward other features of home furnishings. In furnishing and draperies the householder spends readily to attain comfort and charm and has been encouraged in this attitude by the furnisher, who has made considerable progress in educating the householder as to the value of these items. One cannot assume, therefore, that the householder's comparative disregard of charm and comfort in lighting is accounted for by disinterest. It is more probable that he is uninterested because he does not know the possibilities of good lighting nor the way in which to appraise his needs when buying lighting equipment. When a householder goes to buy furnishings for his home, the dealer puts forward every effort to impress upon the customer the beauty and charm of his goods. These are shown in such a manner as to bring these features out, which is a great contrast to the average display of electrical fixtures and devices, where the customer is distracted by the usually large number of fixtures shown at the same place and time, and he can form no conception regarding any one particular item. In this regard the seller of electrical fixtures and appliances can borrow an arrow from the quiver of the interior decorator.

HOUSE-TO-HOUSE CANVASSES

The solicitation of resident business must make use of house-to-house canvassing. There are many ways to take the curse off this method of approach, some of them very ingenious and productive of large sales volume. Success cannot be reached in house-to-house campaigns by merely sending out an army of solicitors who go from door to door and quickly get themselves identified as being in the class of those who are met by the busy housewife with the words, "Don't want anything today." Such work must be intelligently planned in every detail and the customer must be prepared beforehand by general or direct-mail advertising for the call of the solicitor and the whole proceeding given a certain dignity or distinctiveness.

The following list shows the diversity of campaigns that may be put on by any central station to increase its domestic business: Kitchen unit campaigns; portable lamp campaigns; portable bracket campaigns; refixturing campaigns; shade campaigns; relamping campaigns; utility light campaigns; appliance campaigns; electrical home; "red seal" plans; old-house wiring; outlet campaigns; service campaigns; educational campaigns, and many others.

The report of the committee closed with a résumé of the results of a number of these campaigns that were put on by different companies in 1925, and from this résumé one may conclude that such efforts were generally successful in reaching the goal.

PRESENT AND POSSIBLE ANNUAL REVENUE FROM APPLIANCES

Type	Number in Use	Average Watts	Ann. Rev.* at 10 cts. Kw.-Hr.	Present Annual Revenue	Possible Annual Revenue	Increase in Annual Revenue
Flatirons	9,894,000	525	$6.00	$59,364,000	$83,611,300	$24,247,300
Toasters	3,108,600	450	3.50	10,880,100	47,305,000	36,424,900
Percolators	1,816,800	450	3.50	6,358,800	48,913,800	42,555,000
Fans	2,628,300	60	1.50	3,942,450	20,749,700	16,807,250
Heaters	1,320,700	600	5.50	7,263,850	72,638,500	65,374,650
Vacuum cleaners	4,148,600	160	2.75	11,408,650	36,802,100	25,393,450
Clothes washers	2,642,600	175	2.50	6,606,500	31,459,500	24,853,000
Ironers	167,020	175	1.75	292,285	19,485,600	19,193,315
Ranges	304,500	5,500	55.00†	16,747,500	558,250,000	541,502,500
Water heaters	87,810	450	1.50	131,715	17,562,000	17,430,285
Refrigerators	66,960	300	30.00†	2,008,800	401,760,000	399,751,200

*A 10-cent rate is used for ease of adjusting revenue to other rates.
†Energy rate 4 cents per kilowatt-hour.

ADDITIONAL REVENUE FROM INCREASE IN LIGHTING LOAD OF EACH CUSTOMER

A 150-watt lamp in an active socket burning 1,000 hours per year	$217,003,950
A 50-watt lamp in an active socket burning 333 hours per year	24,221,550

Electric Ranges a Desirable Load

N.E.L.A. Domestic Cooking and Water-Heating Committee Report Shows that Electric Range Increases Residential Load Factor, Has Good Diversity and Returns High Revenue per Kilowatt of Demand—System Investment Comparatively Low

AS THE RESULT of three years' intensive study of the characteristics of the electric range as a load and revenue builder for the central-station company the domestic cooking and water-heating committee, under the chairmanship of C. O. Dunten, presented its final report, including the detail report of the range survey sub-committee, Lewis A. Lewis chairman, which had completed a series of exhaustive tests on electric ranges and water heaters in actual operation. Concisely, the findings of these committees show that the electric range load is a highly desirable class of business for an electric utility to add to its lines.

It has been definitely determined that the range load is good business for the power company that has a rate to support it.

The electric range is one of the most practicable heavy energy-consuming devices that can be sold to residential users.

It returns a total revenue per dollar of investment that compares favorably with that derived from any other class of business.

It returns a total revenue far greater than any of the other generally accepted domestic applications, including lighting.

The range added to the average residential installation will increase the annual load factor to 20 per cent from 12 per cent.

It is a soundly developed device and can be supported by the central-station company. It also paves the way for other heavy energy-consuming appliances in the home.

The electric range is an excellent appliance, which will supply the income to support the increased investment cost of rebuilding and revamping distribution systems to heavier capacity.

C. O. DUNTEN

TEST DATA COLLECTED

The work of the range survey sub-committee includes the making of a series of tests on 150 ranges in two different localities—one urban and the other a rural community. The tests covered three seasons of the year for each community—the urban tests being for spring, summer and winter, the rural tests covering summer, fall and winter. The city of Spokane, Wash., was chosen as representative of an average urban community, as with its high density of electric range load it was believed particularly suitable for the tests to be made. It has a population of around 115,000 and its industries are well diversified. The towns of Payette, Idaho, and Ontario, Ore., were chosen as being representative of the average rural community. Payette has a population of 2,500 and Ontario 2,000. The consumers on the outer edges of these towns are chiefly farmers and those in the towns themselves are owners and clerks in stores, professional men and retired farmers.

Description of the methods pursued and objectives in making the studies were published in the ELECTRICAL WORLD, page 1323, for June 20, 1925. From the test data of the complete range survey the following facts have been obtained at the consumer's service switch for the local conditions found in the Northwest.

Ranges.—The maximum demand per range for groups of ranges was found to be practically the same in urban and rural communities and was not affected perceptibly by the seasons of the year. It was found to vary greatly with the number of ranges, and the following data show the test results:

Number of Range Customers	Average Maximum Demand per Range, Kw.	Number of Range Customers	Average Maximum Demand per Range, Kw.
1	3.61	150	0.86
5	1.75	250	0.80
10	1.36	500	0.79
20	1.13	1,500	0.72
40	1.00	5,000	0.70
80	0.89		

These values varied slightly in the two communities; for example, with a change from 50 to 5,000 ranges in the urban community the maximum demand per range changes from 0.95 kw. to 0.70 kw., whereas in the rural community it changes from 1 kw. to 0.712 kw. for the same variation in the number of ranges. Maximum demand values vary only slightly with the seasonal changes; for example, in the urban territory with 150 ranges in a group, the maximum demand varied from 0.88 kw. to 0.84 kw., the low value occurring in the winter. In the

rural community the maximum demand with the same number of ranges varied from 0.87 kw. to 0.83 kw., the low value being obtained in the summer test. The demands recorded during the test were for ranges in active use. Based on 150 customers, the active ranges were 98 per cent of the total.

The diversity factor for ranges at the consumer's service switch was found to vary with the number of ranges as follows:

Number of Range Customers	Diversity Factor	Number of Range Customers	Diversity Factor
10	2.65	75	4.05
20	3.13	100	4.18
30	3.42	150	4.30
40	3.63	1,000	4.85
50	3.78	5,000	5.15

The average annual consumption per range was found to be the same in the rural and urban community, varying between 1,400 and 1,500 kw.-hr.

The typical range load curves for both the rural and urban community show three distinctive peaks—one in the morning varying from 7:30 a.m. to 8 a.m.; one at noon, and one in the evening varying from 5:30 p.m. to 6 p.m. The peak demand in both communities was the same, although the urban connected load was 7.14 kw. per range and the rural 5.744 kw. per range.

In the urban community the evening peak was found to be the greatest during all seasons of the year; the morning and noon peaks being from 50 per cent to 65 per cent and 45 per cent and 60 per cent, respectively, of the evening peak. The evening peak comes between 5:45 p.m. and 6 p.m. except in the winter, when it is fifteen minutes earlier. In the rural community the noon and evening peaks are about equal, the noon peak generally being the larger for all seasons. The morning peak is from 60 per cent to 70 per cent of the noon or evening peak. The maximum range peak was found to occur on any day of the week except Saturday and Sunday.

In the winter season there occurs the greatest coincidence of the range and lighting peaks. In the urban community at this season 75 per cent of the range peak was obtained at the time of the lighting peak, whereas in the rural community 60 per cent of the range peak occurred at the time of the lighting peak. The kilowatt demand per range at the time of the lighting peak based on 150 ranges was found to be 0.62 kw. in the urban community and 0.50 kw. in the rural community.

Based on 150 ranges, the annual load factor was found to be 18.9 per cent, the annual kilowatt-hours per kilowatt of demand were 1,655, and the annual kilowatt-hours per kilowatt of connected load were 199.5.

Lights and Small Appliances.—The average maximum demand for one light and appliance customer in both rural and urban communities was found to be 0.6 kw. and the annual kilowatt-hours consumed were 375 for both communities.

The maximum demand per customer based on tests on 150 customers was found to be 0.242 kw. in the winter season in the urban community and 0.174 kw. in the rural territory at the same season. The kilowatt demand per consumer for lights and appliances during the winter range peak in the urban territory was 0.23 kw. and in the rural territory 0.168 kw. in the same season. During the range peak at this season 94 per cent and 98 per cent of the lighting peak occurred for urban and rural communities respectively.

Based on tests on 150 light and appliance consumers, the annual load factor was found to be 17.65 per cent and 3.05 per cent respectively in the urban and rural communities. The diversity factor was 2.36 for each. The annual kilowatt-hours per kilowatt of demand were 1,545 and 2,682 respectively in the urban and rural communities, whereas the corresponding values for kilowatt-hours per kilowatt of connected load were 137.2 and 142.5.

Ranges, Lights and Appliances.—The maximum demand per consumer in a group of 150 customers using ranges, lights and appliances in the winter season was found to be 1.06 kw. in the urban community and 1.008 kw. in the rural district. The corresponding connected loads were 9.88 kw. and 8.36 kw.

Based on tests on 150 customers, the range, lights and appliances give a diversity factor among ranges, lights and appliances of 1.04 and an annual consumption of 1,799 kw.-hr. The rural annual load factor is 21.4 per cent with a demand factor of 11.45 per cent. The urban load factor is 19.35 per cent and the demand factor is 10.75 per cent. The annual kilowatt-hours per kilowatt of demand for a customer using ranges, lights and appliances in an urban community are 1,695 and in a rural community 1,870. Corresponding values of kilowatt-hours per kilowatt of connected load are 182 and 215.

Water Heaters.—The data on water heater loads are incomplete and not representative of the entire water heater situation, since the maximum rating of any heater was 1 kw. The data must be considered as supplementary rather than conclusive.

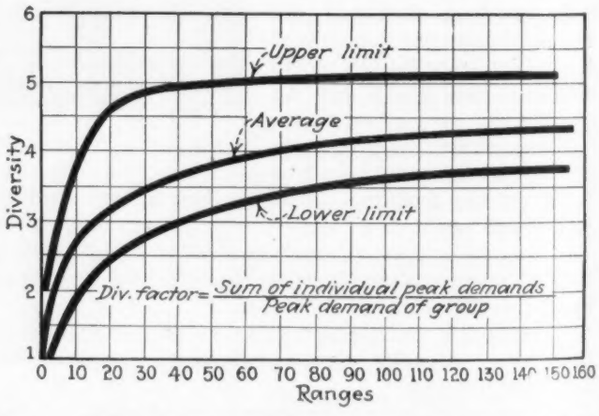


FIG. 1—CURVE SHOWING DIVERSITY FACTOR, ONE TO 150 RANGES

The maximum demand per water heater on the basis of 150 heaters in Spokane on a flat rate was 0.761 kw. with practically no diversity for a large number of heaters. The demand at the time of the evening range peak is 0.599 kw. using 150 heaters, and this value decreases to 0.540 kw. when 5,000 heaters are used. The kilowatt demand based on 150 heaters in Payette on a metered rate was 0.75 kw. There is some diversity because of the metered rate, and for a group of 5,000 heaters the maximum demand per heater is 0.695 kw. The demand at the time of the noon range peak is 0.585 kw., based on 150 heaters. There is some diversity here also and it was found that the demand per heater for a group of 5,000 is 0.536 kw.

The maximum demand for a group of 150 customers in the winter season who used water heaters, ranges, appliances and lights was 1.57 kw. and 1.528 kw. per customer respectively in the urban and rural communities.

The data given in Table I show the maximum demand for one range. With this value of 3.61 kw. for one range and tests on groups of ranges, the kilowatt demand curve per range and diversity factor curve between one and ten ranges were determined. The range diversity factor curve is shown in Fig. 1. As the tests show that there is no change in diversity among ranges for the various seasons of the year in these communities, this curve is applicable for all conditions in this territory. Tests of larger groups of customers showed the diversity to change with the number of ranges, a value of 4.3 being had for 150 ranges.

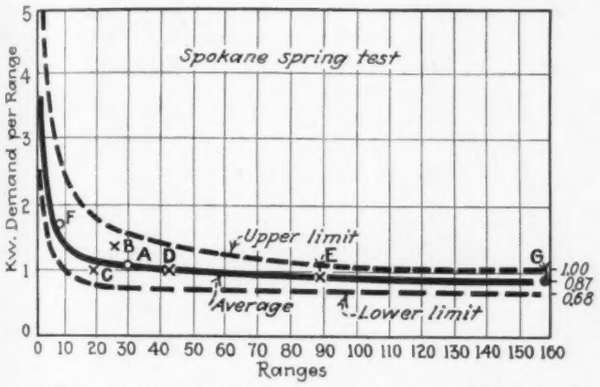


FIG. 2—KILOWATT DEMAND PER RANGE, ONE TO 150 RANGES

The kilowatt demand curve per range from the Spokane spring test is shown in Fig. 2, which takes the diversity into account and is more readily applicable to the range problem than the diversity factor curve. The curves marked "upper limit" and "lower limit" in both cases were determined by taking points with 10, 20, 50, 100 and 140 ranges. Fig. 3 shows the demand per range curve extended to include 5,000 ranges, and it may be noted that the demand per range for 5,000 ranges is 0.70 kw. These demands take into account the diversity as found in the tests and are at the consumer's service switch.

Kilowatt-hour consumption, kilowatt demand, load factors and the demand factors for the different types of service are very useful in studying the characteristics of the range load. Table II gives this information, based solely upon what was obtained during the test; the entire table is exact for a week's period only. Although the tests did not show these values for a year, it was possible to obtain the annual consumption per range from the utilities' books for the year 1925.

Ascertaining Variable Factors

The test data and curves, as has been stated, apply to range loads at the consumer's service switch in the Northwest communities where the tests were made. The only variables to be considered in the application of the data on other properties in other localities are those introduced by geographical location and the habits of the home dwellers and under different social, industrial and local environments. These variables can be determined quite accurately by each utility. Subject to this modification, the data can be applied to any utility system by securing data and characteristics of that system.

Each system must obtain individual feeder load curves, substation load curves and generating station load curves. These should be obtained for days that are representative of annual peak conditions on the system and its various subdivisions. The next important step is to determine the reasonable number of ranges to be served at the end of, say, five years. The next step is to start with the service switch range data as modified by local conditions and add the range load curve to the feeder load curve for the number of ranges expected to be served by each individual feeder. (A typical range load curve to be used in this way for an urban community was reproduced.) Since the demands are at the service switch, the losses must be added to the range load curve. With the new feeder load curves now available it is possible to estimate quite accurately the additional feeder capacity required to serve ranges.

The total number of ranges and water heaters supplied by all the feeders is, of course, known, and it is necessary again to make reference to a load curve to determine the typical load curve for all the ranges at the substation; the distribution losses are then added and this total curve is added to the substation load curve to give the total substation capacity required. The difference between the new capacity and that now available indicates the additional capacity in substation facilities. The same procedure is followed on through to the generating station with substation diversity considered, and it is possible to derive a figure that represents the additional capacity in the entire system to serve the range load.

The total investment in the property to serve industrial, commercial, residential lighting and range load being known, the problem becomes one of allocation to each service of its part of the investment and share in operating and maintenance expense. The proper allocation is an open question and may vary considerably for each electric service company, but with the costs finally proportioned to the satisfaction of those concerned, a rate structure can then be devised, and if its value proves to be such that the public will avail itself of the new type of service, there can be no question that the service should be rendered.

TABLE I—AVERAGE MAXIMUM DEMAND OF AN ELECTRIC RANGE

Place	Number of Ranges Tested	Average Maximum Demand, Kw.
Spokane	45	3.67
Payette	63	3.56
Total	108	3.61

As the result of its specific study of the range load as made by the range survey sub-committee, the domestic cooking and water-heating committee has been able to reach some very definite and significant conclusions. Contrary to popular but misinformed opinion, the demand and diversity factor of the electric range load make it a most desirable class of business for many power companies to encourage. For a total of 150 range users each one is responsible for an average maximum demand of only 0.87 kw. and the diversity factor of these customers measured at the service switch is 4.3. The annual load factor is 18.9 per cent, which compares very favorably with many industrial

power loads. There is very little seasonal diversity, the load remaining virtually the same throughout the year. Energy consumption per range per year is 1,424 kw.-hr. Annual energy consumption per kilowatt of demand is 1,655 kw.-hr., which will return a revenue at a 4-cent rate of $66.20 per kilowatt of maximum demand.

A great amount of research and cost analysis with respect to the range load has been compiled by many central-station companies throughout the country. The committee has made a careful study of these data, which have been published extensively by the technical press and by the National Electric Light Association. A bibliography of such articles has been made a part

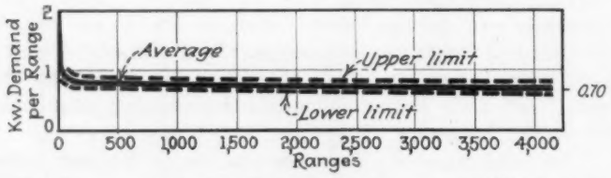


FIG. 3—KILOWATT DEMAND PER RANGE, ONE TO 5,000 RANGES

of the committee's report, which summarizes the outstanding facts as follows:

1. The average domestic customer has a load factor of from 10 to 14 per cent, but the addition of an electric range at once raises his load factor to between 21 and 23 per cent.

2. In single-unit installations the electric range can be made to appear an undesirable load, but with a reasonable number installed a generating station diversity of about 10 to 1 is readily obtained and as high as 12.5 to 1 has been recorded.

3. The value of the electric range load as a revenue producer is well illustrated in one company, where the range returns a revenue of $100 per kilowatt of peak demand, whereas the industrial load of the same property returns only $65 of peak demand.

4. System costs to serve the electric range load cannot be considered on the basis of costs as applied to single isolated installations, but must be considered on the percentage of saturation it will be possible to obtain in a three to five-year period. Just as generating plant and transmission line capacity are determined and installed in advance of requirements, so must the electric range be considered.

5. The question of "peak responsibility" of the range is becoming less important, particularly in territories of an industrial character, where the system peak often occurs during the day and where the evening lighting peak does not overlap the daily peak.

6. The investment to serve the range load decreases very rapidly as saturation increases. A range saturation of 5 per cent accomplished by one company in four years had the effect of decreasing the investment to serve the individual range from $150 to $125 and latterly to $75 per range.

INDUCEMENTS TO ENCOURAGE RANGE USE

The first requisite of any company in promoting the use of the electric range is a satisfactory form of rate. A rate sufficiently low to make the operation of the range economically practical is necessary, of course, but this does not mean an excessively low rate per kilowatt-hour. Companies are promoting range business successfully at rates up to 5½ cents per kilowatt-hour.

Studies of the range load on all kinds of systems, varying from those serving sparsely populated areas to those serving metropolitan districts, show that this device makes a desirable load for any system that offers a proper rate. One characteristic alone, that of improving the load factor on the distribution system, makes it one of the most desirable pieces of business that a power company can add to its lines.

Those companies that have promoted the electric range as a load builder have had no difficulty in planning and executing campaigns. Manufacturers have rendered and will continue to render a very helpful supplementary sales service to the central station in training salesmen and demonstrators and in furnishing details of range sale operations that have been tried and proved successful. In its initial stages of introduction the range must be considered as a pioneering device, and as such a certain amount of promotional sales expense must be incurred. This has been true of every class of business that the power companies now serve, and the desirable features of the range as a load and substantial revenue producer warrant a liberal appropriation for this purpose.

TABLE II—CONNECTED LOAD, ENERGY CONSUMPTION, DEMAND AND LOAD FACTORS, URBAN AND RURAL COMMUNITIES
(Based on 150 Customers in Each District)

Type of Load	Time of Year	Connected Load, Kw.	Max. Demand, Kw.	Kw.-Hr. per Week	Weekly Load Factor, 15 Min., per Cent	Weekly Demand Factor, per Cent	Kw.-Hr. per Year	Annual Load Factor, per Cent	Annual Diversity Factor	Annual Demand Factor, per Cent
Spokane Tests—per Consumer										
Range	Spring	7.14	0.87	24.4	16.7	12.2	....	.....	.....	....
	Summer	7.14	0.88	23.7	16.0	12.3	....	.....	.....	....
	Fall	.....	.....	.....	.....	.....	....	.....	.....	....
	Winter	7.14	0.84	25.6	17.5	12.2	....	.....	.....	....
	Annual	7.14	0.86	.....	.....	.....	1,424	18.9	4.3	12.02
Lights and appliances	Spring	2.74	0.20	8.46	25.2	7.3	....	.....	.....	....
	Summer	.....	.....	.....	.....	.....	....	.....	.....	....
	Winter	2.74	0.246	12.85	31.1	8.95	....	.....	.....	....
	Annual	2.74	0.242	.....	.....	.....	375	17.65	2.36	8.83
Ranges, lights and appliances	Winter	9.88	1.06	37.8	21.2	10.7	....	.....	.....	....
	Annual	9.88	1.06	.....	.....	.....	1,799	19.35	1.04	10.75
Water heater	Summer	0.814	0.761	112.5	88.0	93.33	....	.....	.....	....
Payette Tests—per Consumer										
Ranges	Spring	.....	.....	.....	.....	.....	....	.....	.....	....
	Summer	5.744	0.83	29.5	21.2	14.5	....	.....	.....	....
	Fall	5.744	0.87	33.2	22.7	15.1	....	.....	.....	....
	Winter	5.744	0.87	30.7	21.0	15.1	....	.....	.....	....
	Annual	5.744	0.86	.....	.....	.....	1,424	18.9	4.3	14.95
Lights and appliances	Spring	.....	.....	.....	.....	.....	....	.....	.....	....
	Summer	2.616	0.100	2.99	17.8	3.83	....	.....	.....	....
	Winter	2.616	0.174	7.38	25.6	6.6	....	.....	.....	....
	Annual	2.616	0.140	.....	.....	.....	375	3.05	2.36	5.36
Ranges, lights and appliances	Winter	8.36	1.008	38.2	22.6	12.1	....	.....	.....	....
	Annual	8.36	0.96	.....	.....	.....	1,799	21.4	1.04	11.45
Water heater	Summer	0.967	0.750	76.0	60.3	77.6	....	.....	.....	....

What Committees of the

National Electric Light Association

Have Done

M. S. SLOAN

J. E. DAVIDSON

C. F. HIRSHFELD

E. W. LLOYD

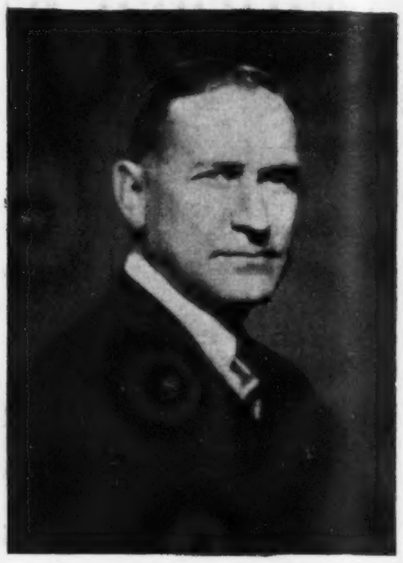
C. M. BREITINGER

MANY workers in the light and power industry have been busy all year in compiling data and information for the benefit of the industry. Much of this work appears in the form of printed serial reports during the year and has little prominence at the annual meeting of the industry. Complete abstracts of the reports appear in the following pages, and a casual reading only of these condensed versions shows that the association this year has more than maintained the standards already established for committee work. In many respects the work of these men is the most important work of the association, for it deals with definite problems in a concrete way. It is to be hoped that the printed reports will receive very thorough study by men in the several branches of the industry, for they embody data and information needed to bring about industry progress.

Public Relations Section Work

Since 1914, 1,183,410 Customer-Owners Have Bought Utility Securities—Women Become Important Elements—Industrial Relations as Affected by Compensation Plans—Public Speakers Now Available

IN THE minds of industry executives public relations work holds first place. This is rightly so because a public utility must serve the public to succeed. This year committee workers report on major developments in public relations. More than 236,000 new stockholders purchased utility securities during the year and added to the already large total of "customer owners." The work of women employees in public relations has grown apace and has become very effective. This has tied in with public speaking, good-will advertising of manufacturers and employee relationship and helped build the existing splendid situation in regard to light and power utility public relations.



M. S. SLOAN
Chairman Public Relations Section

Report of Industrial Relations Committee

THREE important subjects were studied by the industrial relations committee, Homer E. Niesz chairman. These were employment, compensation and pensions. The recruiting and selection of employees by member companies, with special attention to physical and mental requirements, are considered very important for all utilities, as is also the question of the use and necessity for job specifications and successful methods for building them up.

The information on these topics comes mainly from the larger companies with centralized employment and personnel departments, but the principles are equally applicable to smaller companies if suitable modifications are made. A distinct trend is evident toward organized employment in a personnel department. Twenty-three companies reported that they have such centralized departments, and in all but two of these the personnel department includes the employment function. In all these 23 companies there is an endeavor to fill vacancies by promotion from within the company, if possible. In ten of the companies the approval of the employment department is required in making additions to the payroll. Thirteen of the companies require physical examinations and one requires a partial examination. Only five companies reported that they had job specifications, two reported that these were in contemplation and one that specifications were in partial use.

H. E. NIESZ
Chairman Industrial Relations Committee

Last year 109 out of 273 utilities reporting used some plan affording incentive in the form of compensation for one or more groups of employees. This year the committee gave more specific information from 75 of the 109 companies concerning the plans in use.

Most of the plans are of the bonus type—that is, they consist of a basic wage or salary and a bonus upon all production beyond a specified task or quota. There are, however, cases where a salary and commission on all sales are paid to salesmen and also cases where a commission only is paid but a guaranteed minimum of earnings or a drawing account is provided. The plans vary widely in detail, although formulated upon much the same principles.

Fifty-eight companies out of a total of 65 reported incentive plans for salesmen. The next largest number of incentive plans reported—sixteen—applies to meter readers. Six companies reported plans covering various phases of accounting and clerical work, and eleven reported similarly for other groups of workers, including some of those in maintenance and operating departments. Two of the largest companies have a large proportion of their employees covered by incentive wage plans, and a number in the same way cover a smaller but still substantial percentage of their people. Seven companies pay a general bonus which covers all of their employees and is based either on the percentage of common-stock dividends or on other measures of prosperity or production.

The companies which give an opinion about the incentive plan with few exceptions state that it has worked out well both from a financial standpoint and from that of increasing attention to duty, loyalty and interest among employees.

Report of Public Speaking Committee

CONTINUATION of the good work of past years was evinced by the public-speaking committee, with W. S. Vivian as chairman. Programs were carried out in all sections of the country which embodied the development of educational meetings for employees; the speakers' handbook was gratefully accepted and used on many occasions, and throughout the whole industry during the year there was a notable increase in the amount of public speaking done. The committee recommended that groups of every description be told the story and urged to co-operate actively with the utilities. It also

W. S. VIVIAN
Chairman Public Speaking Committee

recommended that monthly reports be made to the public-speaking chairman of addresses given and that there should be more and better training of selected employees for public speaking.

Report of Manufacturers' Advertising Committee

ELECTRICAL manufacturers practically doubled the amount of space used in general advertising for the benefit of the light and power industry, according to the report of Chairman J. C. McQuiston of the manufacturers' advertising committee. Five companies expect to place public relations advertising in national magazines this year, fourteen companies will use "If Electricity Came with Your Groceries" folder, and nine companies will use special direct-mail appeals, including dividend inclosures and other references

J. C. McQUISTON
Chairman Manufacturers' Advertising Committee

in general advertising work. The committee has circularized between 300 and 400 manufacturers in an effort to get their co-operation in distributing the full-page folder, which is similar to that sent out a year ago under the caption "Do You Know?"

Report of Customer-Ownership Committee

CUSTOMER ownership during the year added 236,000 stockholders and raised more than $297,500,000 of capital for the construction needs of the country, as reported by the customer-ownership committee, A. Emory Wishon chairman. Eighteen additional utilities adopted the plan, bringing the total up to 226 companies, rendering service to territories with a combined population of 75,000,000. Since the inception of the customer-ownership plan in 1914 it has been directly responsible for the creation of 1,183,410 shareholders and the obtaining of more than $1,000,000,000 of new capital.

These results are impressive, but they represent only a part of the accomplishments of this remarkable movement. The effect upon public relations has been profound and far-reaching—in fact, has entirely changed the character of electric light and power companies in the public mind. In addition, customer ownership has materially assisted in financing bonds

DATA ON CUSTOMER OWNERSHIP

Summary of Information Reported by 226 Electric Light and Power Companies

Total population of territory served..	75,222,002
Total number of customers.....	14,076,627
Gross earnings of combined companies reporting (1925).....	$1,003,344,587
Stockholders obtained through customer-ownership plan.....	1,183,410
Shares of stock sold through customer-ownership plan.....	10,451,843
Percentage of stockholders obtained through customer-ownership plan to customers.....	8.40
Percentage of shares sold on deferred-payment plan (1925 average)	20.8
Ratio of stockholders to population served.....	1 to 63
Weighted average cost of selling per share (1925).....	$4.12

SUMMARY BY YEARS

Year	Stockholders Obtained	Shares of Stock Sold	Number of Additional Companies by Years Adopting Customer-Ownership Plan
1914	4,044	92,310	7
1915	4,357	57,130	3
1916	3,681	38,183	4
1917	8,242	82,007	8
1918	5,186	42,388	7
1919	19,872	194,021	12
1920	53,063	454,139	34
1921	118,544	830,222	37
1922	156,725	1,450,707	49
1923	279,186	1,806,300	24
1924	294,467	2,478,165	23
1925	236,043	2,926,271	18
Total	1,183,410	10,451,843	226

and debentures at lower interest rates, on the one hand, and in enhancing market values of common stock and in common-stock financing on the other. In brief, in the opinion of the committee, the present prosperity and popularity of the electric light and power industry owe far more to customer ownership than to any other single factor, and it is of extreme importance that this effective status be vigorously maintained.

Any company embarking upon a program of customer ownership should, the committee held, follow closely ten fundamentals defining customer ownership in contradistinction from other forms of financing. These are as follows: (1) Sale of the securities must be direct from company to customer or through an agency expressly created for the purpose and controlled by the company. (2) The safety of the securities offered must be amply protected by property and earnings. (3) A minimum rate of dividends must be provided, in so far as honest judgment based on experience can foresee. (4) A reliable resale market must be maintained in some manner, so that shareholders who wish to dispose of their holdings can do so promptly at nominal expense. (5) A partial-payment purchase plan must be operated in order to give every customer who can save a small amount monthly full opportunity to become a shareholder and to encourage thrift. (6) The proprietary interest and responsibility of shareholders must be emphasized and the shareholders supplied regularly with information regarding their company and its affairs. (7) Loss of capital by shareholders is hazardous, and fraudulent offerings from various sources must be guarded against by the rendering of authentic information and advice to shareholders. (8) The number of shareholders must be increased steadily, and efforts should be made to avoid large individual accumulations of stock. (9) Employees must be carefully instructed in order that all representations made to customers or others shall be in line with the facts. (10) Managements must realize that customer ownership multiplies their obligations to the public and intensifies the trust reposed in them. It does not replace the constant striving for higher efficiency, good service, reasonable rates, courtesy and progressive public relation policies.

Within the past twelve months there has been an unusual quantity of criticism regarding corporate financing, and much of it has in some way concerned customer ownership. Criticism has not been directed at customer ownership in the electrical industry itself, but at its effect upon other kinds of financing for

A. E. WISHON
Chairman Customer-Ownership Committee

industry in general and at the possibly disastrous effects to the general public which may result from the abuse by outsiders of the confidence which our industry has built up in investment in equity or junior securities.

The committee and the industry had foreseen that customer ownership would be adopted by other industries and realized its lack of power to prevent such imitation, either honestly conceived or in connection with hazardous or fraudulent ventures. The general public has often failed to see the virtues of basically sound industries which could use customer ownership to advantage and has even failed to distinguish between the seasoned stocks paying a definite dividend rate and the common stocks of companies subject to speculative manipulations on the exchanges.

The early and repeated contention of the committee that customer ownership should be surrounded with the greatest of care and only those securities offered under this plan which will pay a definite return regularly and maintain their market stability has been universally heeded by member companies. The records show, for example, that in 1925 utility companies selling stocks under this plan issued over $60,781,000 of common stock, as opposed to over $254,000,000 of preferred stock, while bonds, debentures and notes totaled $9,820,000. Concerning the common stock issued, the committee

asserted that it has learned of no instance where such stock was not a stable security which had paid dividends regularly for a long period of years and was amply protected by property and earnings.

The committee expressed no fear of the successful maintenance and steady progress of customer ownership in the electric light and power industry if the members will continue to exercise the high integrity, prudent care and widespread and consistent publicity which have characterized their efforts in the past. It is only through education that the people can be protected against hazardous and fraudulent ventures, and the committee recommended continuance of full, complete and effective publicity, including advertising, in order that the securities offered under the customer-ownership plan may be fully understood and the points differentiating them from less safe securities be fully grasped by the greatest possible number of people.

There has been some tendency on the part of some companies to relinquish customer-ownership activities for various reasons. The committee urged that every possible effort be taken to renew customer-ownership activities, wherever possible to do so, and that these activities take the form of endeavoring to reach new shareholders rather than selling additional stock to those already possessing it. It also urged that the customers be made thoroughly acquainted with the resale agreement and that those who sell stock shall not make false representations as to what the company will do to maintain a resale market.

Report of Women's Committee

IN THE five years since its formation the women's committee has done notably good work. The committee this year, with Miss Elizabeth Lee as chairman, has continued the work of past years and amplified the scope of the committee activities. The great objective this year was the development of a large number of worth-while speakers, and this program has been well advanced. The object is to get an increasing number of people who can speak sympathetically and intelligently both to industry groups and to groups without the industry of the great forces affecting the service upon which public utility prosperity and advancement are continued and upon which the utility itself is dependent. A permanent secretary to the committee has been appointed with location at headquarters, and representatives from manufacturing companies of consequence have been appointed to the committee.

ELIZABETH LEE
Chairman Women's Committee

Educational work for newer organizations was one of the features of the committee activities. Definite programs were carried, with meetings held once a month in the majority of companies and in many instances twice. In other companies the meetings were held quarterly and sectionally. Good speakers among the members of the committee were developed during the year, and many of them have given addresses to the public and to utility classes. In the metropolitan section an incomplete count showed 339 addresses given, and in the Southwestern Division 21 companies established public-speaking classes with instructors. In addition there were nearly 200 addresses given by representatives of the committee. In these central divisions 31 talks were given in the State of Ohio; in the Great Lakes division 42 addresses were given, and in the Southeastern Division more than 65 addresses were made to outside groups. Nearly every division now has well-qualified public speakers developed from the public-speaking classes. Other work of the committee during the year was a study of special subjects, activities in stock campaigns, work with safety and first aid, and development of better public relations and publicity for the women. The committee wishes to secure still more sympathy and attention from executives and officials in the carrying out of its broader plans for the industry.

What the

Rate Research Committee

Says About

RESIDENCE RATES

RESIDENCE service continues, and is likely to continue for many years, the most important field for rate research. Although it has always been a subject of study, it merits the same intensive research of characteristics and possibilities now being devoted to rural service. Rural service is still in its elementary stages, it being estimated that only about 3 per cent of the 6,000,000 farms in the country have electric service. The financing of such service is a problem of the future. Residence service is now available, in many larger cities at least, to 90 per cent of all dwellings. The more effective utilization of the existing investment in such service is an ever-present problem. Rate studies of typical member companies indicate that the average annual revenue per customer is practically stationary and in cases decreasing. Load factor continues low, even for the class where diversity factor is taken into account. A large number of small customers are served at less than the cost of service, including a reasonable return. The vast majority of appliances in number, although tending to popularize electric service, are nevertheless poor consumers of energy. The electric range, refrigerator, hot water heater and space-heating device are possibilities and the present-day residence rate problems involve the most practical way of promoting their use. Studies are under way to determine the limits of economical operation in these particular fields, with special consideration to existing and potential competition through the use of natural fuels and gas. Some studies have been made of "follow-on" rates and their effect on use. Such studies are important and should be continued, and although care should be exercised not to exaggerate the influence of the form of rate schedules, there is no reason why the maximum benefits should not be obtained by employing forms of schedules that will encourage utilization of electric service in the home, at the same time recognizing the importance of factors other than the cost of operation, such as the cost of installation, absence of labor, convenience and reliability.

Special and General National Committees Have Been Very Active

Lamp Committee Reports Trend Toward Higher Voltage Lamps and Warns Against Imported Inferior Lamps—Rural Electrification Program Making Rapid Progress Under Co-operative Agencies—Educational Relationships Increase Rapidly—Reduced Cost for Wiring a Major Problem

THE printed reports of the special and general national committees of the association were only four in number this year, but these are of the highest quality and importance. Especial attention is called to the report of the lamp committee, showing the trend toward 115 and 120-volt lamps and calling attention to the importation of large numbers of carbon lamps. Another topic of national importance is rural electrification, and the report this year has some very tangible information on this subject. Educational work and a reduction in wiring costs are the other outstanding reports which should be studied carefully.

Report of Educational Committee

PROOF that the courses prepared and distributed by the educational committee have been very acceptable to the industry was contained in the report of Chairman Fred R. Jenkins. During the fiscal year ended March 1, 1926, the number of enrollments in the various courses was as follows: Practical electricity, 567; lighting sales, 170;

F. R. JENKINS
Chairman Educational Committee

merchandise sales, 155; power sales, 136; accounting course, 294; advanced accounting course, 168. This is a total of 1,490 subscriptions and indicates a fairly general use of the courses in all parts of the country.

The committee has prepared and is now publishing the following courses for the Commercial Section: (1) A lighting sales course of twelve lessons, (2) a power sales course covering the application of power for all purposes, (3) a merchandise sales course covering fully electrical merchandising and all its branches, and (4) a course in practical electricity.

The following courses are published for the Accounting Section: (1) Elementary accounting course, which is a mercantile course covering the fundamentals of bookkeeping and accounting, and (2) an advanced accounting course, revised by a committee of 20 representatives, covering all phases of electric utility accounting and conforming strictly to the uniform classification of accounts of the National Association of Railroad and Utilities Commissioners as adopted by the association.

All of the courses are home-study courses carrying with them the usual correspondence features. A certificate signed by the president, the chairman of the section and the chairman of the committee is awarded to all subscribers upon satisfactory completion of any of these courses. The committee is now working on the compilation of a course in commercial heating and cooking and preparing to compile a course in domestic refrigeration for the Commercial Section.

Report of Rate Research Committee

IN THE report of the rate research committee (Edwin Gruhl chairman) the development in rate making during the past few years was described. This development is remarkable, the committee held, when the limitations, both practical and legal, which surround the formulation of the industry's rate schedules are considered. In the first place, there are inherent characteristics of the business which require a policy on the formulation of rates of charge, recognizing, first and foremost, a definite understanding with the customer as to what the service he may demand in the future is going to cost, and a more smoothly working and harmonious relationship between purchaser and consumer than exists in any other field of commerce.

A second limitation in the development of an effective policy in the formulation of rate schedules rests on the cost of service. Rates must be sufficient to meet operating expenses, provide adequately for reserves and pay a reasonable return upon the fair value of the property necessary to conduct the business. Unless the business, and every part of it, has properly developed rates, it will not prosper.

EFFECT OF REGULATION ON RATES

A third limitation is that applying to all public service corporations under the principle of regulation, that rates must be reasonable, yield a fair return upon the fair value of the property devoted to public use, and that they must not discriminate in price charged as between customers similarly situated.

Finally, there is the limitation of competition. It is highly desirable that schedules for the supply of electricity should be carefully prepared to meet

EDWIN GRUHL
Chairman Rate Research Committee

competition arising through the constant widening of the field of electric service.

There are limits, however, to the use of rate schedules to finance extraordinary investment. The rural service problem is primarily one of financing the utility investment to reach a distant customer and, what is of almost equal importance, a problem of financing the investment in electrical appliances upon the customer's premises. Similarly circumstanced as to investment per customer and unit of demand, rural service can be rendered at rates approaching those charged for urban service.

Report of Lamp Committee

DURING the year 1925 there were sold in the United States a total of 263,000,000 domestic large tungsten-filament lamps, an increase over the preceding year of 0.76 per cent as compared with an increase in 1924 over 1923 of 7.4 per cent. These figures do not include miniature lamps, flashlight lamps, Christmas tree lamps, automobile lamps and some other special varieties. This report of the lamp committee (Frank W. Smith chairman) goes on to state that the sale of large carbon-filament lamps in 1925 aggregated a little over 16,000,000, domestic carbon lamps numbering 2,500,000 and imported carbon lamps 13,750,000.

A survey of the use of carbon lamps shows that some of them are used where maintenance is very expensive and where cheap lamps are warranted, but there has also been much failure on the part of the public to appreciate the inefficiency of the carbon-filament lamps and they are still being employed needlessly and improperly in residences. Further, they are sometimes used where a colored lamp is wanted and where buyers do not discriminate between carbon and tungsten-filament lamps since the coating conceals the filament. The marked increase in the importation of foreign carbon lamps of high wattage consumption and their improper use are therefore a matter of concern to American light and power companies.

In the figure is shown graphically the number of all types of lamps sold each year, beginning with the year 1907. It also shows the aggregate lumens of the lamps sold each year as the increase in lumens is much greater than the increase in number of lamps sold.

In Table I are given the average lumens, watts and efficiency expressed in lumens per watt of lamps sold during the past three years. It is seen that the average wattage of lamps sold in 1925 was higher than ever before. A study of the distribution by voltage is shown in Tables II and III, which indicate the relative demand for lamps during the past three years segregated into various voltage groups. It will be seen that there is no material change in the demand for the various voltage groups except a decrease in the street-railway group and an increase in the 30-volt and 60-volt groups, which are mainly used in train lighting as well as individual farm-lighting plants. The distribution of lamp sales on the basis of standard voltage within a range of 100 volts to 130 volts for the past three years is shown in Table III. As in the past, the sale of the 115-volt lamp continues to be the largest in volume, but demand for the 120-volt lamp, while somewhat less, has shown the largest rate of increase in the past two years. There has been a progressive reduction in the use of the 110-volt lamp, and it appears to be evident that the demand is settling on 115 volts and 120 volts as the two standard types. Demand for lamps in the 230-volt group is relatively small compared with the 115-volt group.

The average size of the street series lamps sold in 1925 was 2,100 lumens, an increase over the previous year. The relative demand for the different sizes of ampere ranges is shown in Table V.

TABLE I—AVERAGE LUMENS, WATTS AND EFFICIENCY OF TUNGSTEN-FILAMENT LAMPS

	1923	1924	1925
Average lumens	692	705	712
Average watts	55.6	56.4	57.6
Average lumens per watt	12.4	12.5	12.4

TABLE II—DEMAND BY VOLTAGE GROUPS, IN PER CENT

	1923	1924	1925
115-volt group	88.8	89.4	88.8
230-volt group	3.9	3.1	3.5
Street series group	1.6	1.8	1.5
Street railway group	2.3	2.3	1.6
30-volt and 60-volt group	2.2	2.2	3.4
Miscellaneous	1.2	1.2	1.2
Total	100.0	100.0	100.0

TABLE III—DISTRIBUTION OF LAMPS BY VOLTAGE IN 115-VOLT GROUP (PER CENT)

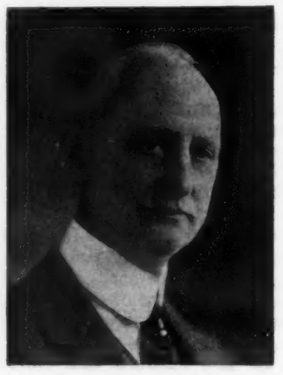
Voltage	1923	1924	1925
100–109	0.5	0.1	0.3
110	22.9	19.4	16.5
111–114	0.4	0.2	0.2
115	42.8	43.6	44.6
116–119	0.6	0.3	0.1
120	26.9	29.7	31.3
121–124	.....	.....	0.2
125	5.1	5.9	6.0
126–130	0.8	0.8	0.8
Total	100.0	100.0	100.0

TABLE IV—DEMANDS OF LAMPS BY SIZES—ALL VOLTAGES (PER CENT)

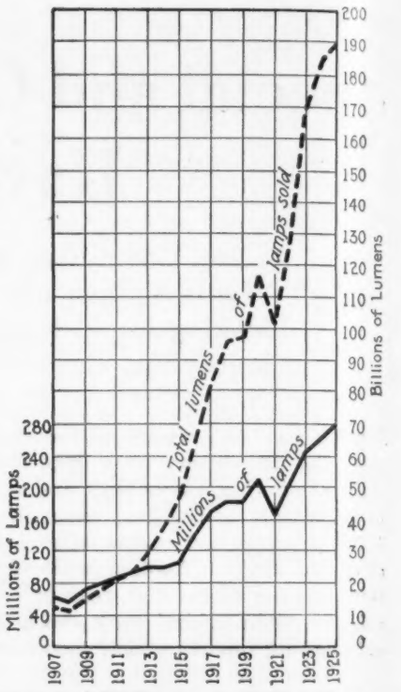
	1923	1924	1925
10 watts	4.8	4.7	4.5
15 watts	5.3	4.4	4.0
25 watts	19.9	20.1	22.2
40 watts	17.3	17.5	14.9
50 watts	17.9	18.5	18.4
60 watts	10.9	9.8	8.9
75 watts	6.6	6.8	7.4
100 watts	6.9	7.2	7.7
150 watts	1.5	1.6	1.8
200 watts	2.7	2.6	2.8
300-1,000 watts	0.9	1.1	1.1
Street railway	2.3	2.3	1.6
Street series	1.6	1.8	1.5
Miscellaneous	1.4	1.6	3.2
Total	100.0	100.0	100.0

TABLE V—DEMAND FOR STREET SERIES LAMPS BY SIZE (PER CENT)

Under	1923	1924	1925
600 lumens	7.8	9.5	9.9
600 lumens	20.1	22.5	23.5
800 lumens	8.6	8.4	7.7
1,000 lumens	26.2	25.2	25.4
2,500 lumens	15.3	14.5	12.2
4,000 lumens	11.9	10.8	8.9
6,000 lumens	8.4	7.7	9.3
10,000 lumens	1.7	1.4	3.1
Total	100.0	100.0	100.0



F. W. SMITH
Chairman Lamp Committee



GRAPHIC COMPARISON OF SALES OF LAMPS AND LIGHT CAPACITY

The lamp committee arranged for a lamp exhibit at the convention. This was very artistically arranged, with the use of color, and formed an attractive feature. The exhibit included the new standard line of "Mazda" lamps, with their special qualities and unusual features. A striking panel showed the value of the lighting load to the utilities, and a motion picture conveyed important messages on illumination.

Report of the Electrical Wiring Committee

COSTS of electric wiring were the chief concern of the wiring committee, of which A. P. Good is chairman. The committee took a decided stand against those who apparently desire to increase the cost of wiring by imposing unnecessarily expensive requirements and restrictions on the methods of doing the work and on the material employed. In regard to the "all-metal" code the committee went on record as being emphatically opposed to the use of this code to the exclusion of any other wiring method. It cannot be stated, the committee held, that this code is the only one which fulfills the requirement of safety to life and property. There are many other methods of wiring which adequately meet that definite requirement, and the committee did not feel that the all-metal code is necessarily safer than the rest. The point is that the other methods are usually less expensive to install and therefore will meet with less resistance in the extension of the central-station business. It was not felt that there is any hazard in the use of non-metallic sheathed cable, and the use of this method should be encouraged. A fur-

ther argument used against making a hard and fast requirement on a certain wiring method was that such action precludes the possibility of developments in the art, since no inventor or manufacturer will lightly enter on a campaign to introduce new methods or devices if it is known that the first hurdle in the race is to procure a revision of existing rules.

The use of demand factors for calculating wire sizes of mains and submains has been shown to be entirely practicable and is now being considered by a sub-committee. The demand-factor table which has been in use in the electrical code of the city of Chicago has been frequently published in the technical press to encourage municipal and underwriters' interest in the use of such tables, as by the use of these factors an appreciable saving results in the cost of wire and conduit.

An analysis of the National Electrical Code was made, and a proposed revision of the code was presented. It is believed that the code can be clarified and it has been classified into seven

A. P. GOOD
Chairman Electrical Wiring Committee

fundamentals, with perhaps an eighth fundamental under the title "Where the Rules Apply." This classification is as follows:

1. Continuity of conductors.
2. Insulation, (a) by dielectric, (b) by isolation.
3. Protection of insulation, (a) against mechanical injury, (b) against heat damage, (c) against dampness and chemical action.
4. Protection against fire risk, (a) by ample carrying capacity, (b) by overload releases, (c) by isolation from inflammable material.
5. Protection against risk to human beings, (a) general, (b) grounding.
6. Identification of material.
7. Conformance to code.

These recommendations were made by a sub-committee whose report was included as an appendix to the report of the whole committee and supplementing it.

The committee stated its belief that the present rules in the National Electrical Code for the protection of motor circuits as far as wire sizes are concerned are unnecessarily restrictive. A large amount of money can be saved to the power consumers in this country if the National Electrical Code rules are altered and made less restrictive in this respect. This subject ties in somewhat with considerations of the use of demand-factor tables.

A number of test installations have been made with bare neutral wire throughout branch circuits on the property of the Edison Electric Illuminating Company of Boston and in connection with service mains—that is, the part of the main between the service outlet and the service switch—on residence installations at Rochester, N. Y. The first of these installations was made under the supervision of R. S. Hale and the second under the supervision of D. G. Durfee. These installations are being watched with considerable interest, and in connection with the installations at Rochester their service wire neutrals, which have been in service on house wiring for ten years, were pulled out of the service conduit and no corrosions or other indications of deterioration were found. There are about one thousand of these bare neutral services in use in Rochester. An extensive investigation on the possibilities of the use of bare neutral wire is now being made in Chicago. Experimental installations of this character are to be encouraged, the committee held. It is hoped that within another twelve months such progress will have been made that a more definite and comprehensive report on the subject may be available. If a bare neutral wire can be safely and successfully used and insulation of the neutral then not be necessary, a saving will result, especially in the reduction of the size of conduit required.

In regard to the grounding of portable electric appliances, the committee was not sure that such a practice would not introduce hazards which would counterbalance the benefits which might be obtained in connection with attachment plugs and receptacles, a sub-committee report concerning which was included as an appendix. Reference was made to the difficulty presented by the use of household appliances requiring large currents up to 15 amp. It was suggested that as the present limitation of the branch circuit is in reality the fuse, a new type of fuse and fuse receptacle designed for branch circuits of only 15 amp. might afford a solution of some of the difficulties. A specially designed fuse and fuse receptacle would not only possibly solve the difficulty but would offer a means whereby the present overfusing of branch circuits might be considerably reduced. Another method that would possibly prevent the overfusing of circuits would be the adoption of such a rule as is now in effect in some of the larger cities requiring a circuit for a certain unit-square-foot surface area. By such a rule more circuits are installed than is now ordinary for the same unit area. This matter is still in consideration by the committee, which is endeavoring to work out a solution which will not cause confusion and irritation to the householder.

In reference to additional safety rules for the National Electrical Code, the committee believed that the addition of such rules would naturally tend to bring about an increased cost of installation, and it is questioned whether the additional safety obtained warrants the possibly increased cost. The wiring committee had some criticisms submitted to it on the so-called model uniform electrical ordinance, and these criticisms were passed on to the authors of the ordinance. Some of the criticisms have been admitted to be justified, and it is possible that there will be further consideration given to the wording of some of the sections of the ordinance. While it is recognized that the model ordinance will not be found perfect for all situations, yet the committee recommended that the National Electric Light Association approve the proposed model ordinance, not as final, but as a basis for guide and suggestion for member companies when they shall have occasion to consider an ordinance suitable for their local conditions.

Report of Water-Power Development Committee

WATER-POWER development progressed at an accelerated pace during the past year, but with no outstanding changes in the general situ-

W. E. CREED
Chairman Water-Power Development Committee

ation, according to the report of the water-power development committee (W. E. Creed chairman). Most of the projects under construction at the beginning of last year have been carried to completion. East of the Rocky Mountains fourteen new plants were placed in operation and two other plants were enlarged. The total increase in Eastern generating capacity was 411,850 kva. Muscle Shoals, with its 90,000-kva. generating capacity, is included in this figure. West of the Rocky Mountains nine new plants were completed and two existing plants were enlarged. The addition to Western generating capacity was 331,000 kva. The total increase for the whole country was 742,850 kva., which was in excess of any previous year, making 1925 a record year for hydro-electric installation.

Measured in kilowatt-hours, the total output of water-power plants increased from 19,969,463,000 kw.-hr. in 1924 to 22,322,000,000 kw.-hr. in 1925, or 11.8 per cent. The greatest increase was west of the Rocky Mountains, where the 7,562,891,000 kw.-hr. of 1924 grew to 9,860,965,000 kw.-hr. in 1925, or more than 30 per cent. A large percentage of this increase was due to a better water year than in 1924, particularly in California. In the region

east of the Rockies the increase was from 12,406,572,000 kw.-hr. to 12,461,215,000 kw.-hr., or about 0.4 per cent.

The proportion of water to steam power remained about the same as in 1924. That is, water power again represented 34 per cent of the total, and steam 66 per cent.

Inter-regional connection, the diminishing number of permits issued by the Federal Power Commission and legislation affecting water power were also covered in the report.

Report of Rural Electric Service Committee

A GENERAL consideration of the rural service situation in the country was contained in the report of the rural electric service committee (G. C. Neff chairman). The committee proffered some advice to central-station executives regarding the handling of rural service plans, briefly reviewed the results of co-operative investigations in about 20 states, presented cost data on rural lines, adverted to the plan for rural service development which was presented in the report for 1925, and included as appendices the general rural extension plan of the Adirondack Power & Light Corporation, Schenectady; the rural service plan of the Ohio Public Service Company, Cleveland; the plan of supplying rural electric service of the Iowa Railway & Light Company, Cedar Rapids; the rural service plan of the Wisconsin Power & Light Company, Madison, and General Order No. 27, Public Service Commission of the Commonwealth of Pennsylvania, establishing rules and regulations for rural service.

The committee found generally that most utility companies were acquiring a better understanding of rural service problems, and also that the farmers themselves were acquiring a better understanding of the problem as it affects them through the media of newspapers and periodical farm publications, which have devoted considerable space to generally thoughtful and well-informed consideration of the matter.

This better understanding of rural electric service by both the utility and the farmer is sure to accelerate the building of farm lines. This is as it should be, but the committee desired to issue a word of caution. Rural electric lines should be built only to groups of farmer customers who will agree to use a sufficient amount of energy in a manner that will enable them to profit while paying to the utility which serves them a rate sufficient to pay the cost of the service. If rural lines are built under conditions where either the utility or the farm customers will lose money because of the service, there is trouble ahead, and the utility company must assume the responsibility of making the necessary study to determine whether or not prospective farm customers can and will use sufficient energy to make it profitable to both.

The committee took occasion to advise utility executives in regard to the handling and development of rural service departments in their organizations. There are two viewpoints from which to regard rural electrification. The first is public relations and the second the development of a future market. The first particularly requires the attention of responsible men in the organization who are able to meet the farmer on his own ground and gain and keep his confidence. There are many men in the electrical industry who can see no future market for electrical energy on the American farm, but in spite of these opinions it has already been definitely determined that the farm can advantageously use many times as much electrical energy as is now being consumed by the average city residence. It was only a comparatively few years ago that many men prominent in the industry contended that service to city residences could result in nothing but deficits, and it is significant that the men of the industry who have put in the most time studying rural service are the ones who are most hopeful of living to see the farmer a very acceptable customer.

G. C. NEFF
Chairman Rural Electric Service Committee

On account of these two matters of public relations and future load, it behooves every utility company to exercise great care in the selection of the man who is to look after the farm business. Such a man should have many qualifications. He should know the electrical business and know the farm business. He should know farmers' psychology. He should have a sincere interest in the farm and know how to apply electric power to farm operation. He should know salesmanship, construction and human nature and should, finally, have the gift of imparting information without offering offense.

About twenty different states have organized joint committees for the study of rural electric service, and although all of these committees have not been organized for a long enough time to arrive at specific conclusions, the results to date clearly show that with such types of farming as dairying, poultry raising, stock raising, fruit growing and vegetable gardening there are possibilities for building a load which will be attractive to the utility company, improve living conditions on the farm and in many cases show a very worth-while financial return to the farmer. The results of the work of these committees are released from time to time in state publications and in the bulletins issued by the Committee on the Relation of Electricity to Agriculture. A number of them have already been published.

The cost of rural line construction is of necessity an extremely variable item on account of the different types of construction used and the wide differences in the physical characteristics of the territory served. Voltages of 2,300, 6,600 and 11,000 are quite common on present-day rural lines, and one company is using 13,200 volts. The tendency appears to be toward the higher range of voltages, with many companies now standardizing on 6,600 volts. The average costs of rural-line construction as presented in the report were compiled from a questionnaire sent to a number of companies. Owing to misunderstandings of the questions, the replies were not always directly comparable and the average figures had to be arrived at by a corrective process. However, it may be stated that the cost per mile varies from a minimum of $1,200 to a maximum of $1,984 when completely equipped with lightning arresters, transformers and meters to serve three customers. On account of the fact that the cost of rural-line construction is so large a part of the cost of rural service, it is essential that this phase of the problem shall have very close attention and that the type of construction best adapted to the particular conditions shall be definitely ascertained. Assuming that three customers can be served by one mile of line and assuming fixed costs of 16 per cent, a difference of $300 per mile in cost of line makes a difference of $1 per month per customer. This is a material difference in the cost of service and shows the importance of standardizing on the proper type of rural distribution lines.

PLANS FOR RURAL DEVELOPMENT

In last year's report the committee made rather complete and detailed statements regarding a definite plan for the development of rural electric service by utility companies. This plan was designed to encourage increased consumption by the farm customer. The committee did not find any reason during the present year to change its recommendations regarding this plan, but, on the contrary, desired to place added emphasis on these recommendations. It is firmly believed that increased use of electric service by the average rural customer is essential to the successful development of rural electric service. In order to obtain this increased use, however, it is necessary for the farm customer to spend more money for electrical equipment and appliances than the utility will invest in lines to serve him. It was recommended very strongly that any utility company developing a plan for supplying rural service should keep this fact in mind.

Another factor which has a great deal to do with increased consumption is the form of rate itself. A rate which has a large part of the fixed cost distributed over the energy charge makes the bill for service to the small user less than cost and to the large user more than cost. Such a rate penalizes the larger user, which is very undesirable. The appendices to the report show an appreciation of this condition, and in every case the proper return on the cost of the investment necessary to serve the farm user is taken care of separately from the charge for energy consumption.

Commercial Men Advance Their Cause

Range Survey Completed — Refrigeration Builds Load Factor—Industrial Heat Advances Rapidly—Home Loads to Be Exploited — Merchandising Plans Developed

THE commercial activities of the light and power industry have reached a height and an intensity hitherto unknown. The eyes of the industry are focused on means for building loads intensively and for getting better load factors. Commercial men are rising to the occasion by measuring values and by perfecting their organizations. Some of the notable commercial reports are abstracted in the following pages and others will be found treated as special articles.

E. W. LLOYD
Chairman Commercial Section

Report of Load-Factor Committee

FACTS in connection with load-factor improvement and the effect of this improvement on the generating and distributing systems formed the basis of an important discussion by the load-factor committee, with R. H. Tillman as chairman. The committee pointed out that what constitutes a good load factor depends very largely on the system considered and on local conditions and the investment made in equipment on the basis of some definite load factor.

On the other hand, a general improvement of load factor is advisable for all the industry because fixed costs have increased. This improved load factor is difficult to obtain, and possibilities of getting a better diversity of load appear to be best. The load factor is in the hands of the consumer, and any action taken to affect it directly brings the user into the question. No great cure can be prescribed that will correct all cases. The station load is a direct reflection of the habits and methods, the labors and recreations of a community, and any change in these habits and methods will directly influence the station load factor.

The load factor may not mean as much in dollars and cents to the station as it does to the distributing system. The station equipment requires periodic tests, and it may be advisable to have a lower load factor so that equipment may be removed from service and tested. Also, there may be depreciated equipment which it is entirely satisfactory to operate for short periods on peaks but which it would be out of the question to consider for base-load or high-load-factor business. On the transmission and distribution systems, however, capacity is good for constant load, and within reasonable limits the more constant it is the better. In the table data are shown on the load-factor conditions and consumptions of residence load in several large cities. The table shows positively that one great method of improving load factor is to increase the consumption per customer in the residence business. In order to encourage better load factor, rate schedules should provide for a fixed-demand charge to be maintained for as long a period as possible. The more frequently a customer is permitted to vary his demand requirements, the stronger will be his tendency to impose a poor load factor on the utility supplying him.

R. H. TILLMAN
Chairman Load-Factor Committee

The question of diversity must always be considered in all rate studies when fixing demand prices.

In the opinion of the committee the residential field is a very fertile one for providing new and additional uses of electric service, and action to encourage this business through offering a low secondary rate should be taken and the sales of appliances pushed. Generally all refrigeration is a good load-factor business, and domestic refrigeration is ideal if the appliances are used in large number. The wiring required for the increased consumption and use of appliances in homes can be taken care of very adequately if the utilities in the different territories will pay some attention to this phase of the activities of the electrical industry.

Other possibilities of good load factor lie in the realm of street lighting, where, the committee held, wattage consumption might be doubled or tripled with profit both to the utilities and the communities they serve. In industrial uses also there are certain things that may be done, although many of the working periods are fixed definitely by the industrial habits of the nation. Certain new uses and certain adjustments of hours of work and use of equipment can be made to improve load factor.

KILOWATT-HOURS PER RESIDENCE AND PER CAPITA IN ELEVEN LARGE CITIES

Company	Kw.-Hr. per Residence Service	Kw.-Hr. per Capita	Primary and Secondary Rate per Kw.-Hr.	System Load Factor
A	338	226	7.5/6	38.7
B	350	348	9.5	38.3
C	358	548	8/7	49
D	394	858	8.5/6.5	44.1
E	408	636	8/6	44
F	424	706	8/4	52.2
G	441	487	7/2.5	44.6
H	463	673	12/4	49.9
I	499	846	9/6/3	47.5
J	500	752	5/5	45.4
K	673	1,190	5/4/1.5	49.6

Report of Merchandising Committee

AN UNUSUAL form of report was employed by the merchandising committee (T. L. Phillips chairman), which presented its findings as a play in three lively scenes. The argument of the drama was the neglect of most central-station merchandising departments to push the sale of appliances which have long been on the market and which if widely distributed will cause appreciable increases of consumption among domestic consumers. The action takes place in a dream of a central-station merchandising manager, aptly named Dormant Dolittle, whose slumbers are rudely discomposed by animated appliances. They come to him with their complaints of being left to gather dust upon the shelves and not put out to perform their various func-

tions in the world. Will Pressem, the electric flatiron, is typified as the ancient champion of electrical appliances, but one whose merits Mr. Dolittle has evidently forgotten for lo, these many years. However, a new champion has arisen in the person of Pete Polaris, the electric refrigerator, whose newness and novelty are attracting wide attention and on whose coattails other appliances may enter many homes. The play closes with the awakening of Mr. Dolittle firmly resolved to mend his ways and to sell electric appliances faster than the factory can turn them out.

Report of Refrigeration Committee

THE report of the refrigeration committee, of which G. E. Miller is chairman, was this year devoted principally to the reconcilement of two apparently but not really divergent interests of the central station in regard to domestic electric refrigeration. Many central-station executives have felt some hesitation about embarking upon a campaign to add domestic electric refrigeration to their lines on account of the fact that they were already supplying large quantities of energy to makers of artificial ice and felt that to push domestic refrigeration was to antagonize the ice makers. The report asserts that this is a mistaken conception of the situation and that actually all advertising and efforts to popularize domestic refrigeration do in large measure redound to the profit of the ice manufacturers because of the necessarily wider appreciation of the value of refrigeration in the home whether it is produced mechanically or by the melting of ice. It is quite true that some salesmen in their enthusiastic efforts to sell domestic electric refrigerators have made invidious statements concerning ice refrigeration. These tactics are not at all excusable; neither are they necessary, and every central station should purge the selling talks of its representatives of such reflections.

The report is not long, the committee having felt that there was no point in adding to the mass of information which was published last year, since this information still retains all of its value and covers the field very thoroughly. In this connection the report draws attention to the large amount of domestic refrigeration material which was published this year in the technical press. In regard to machine design

G. E. MILLER
Chairman Refrigeration Committee

progress during the year nothing of great moment has been announced. The absorption-type machine continues to exercise a great fascination, but as yet there are no electrically operated machines of this type available in the United States. Many of the older manufacturers have expanded their manufacturing facilities to take care of a much larger production than heretofore, and many have added new sizes and slightly different designs to their lines. One of the principal achievements during the year was the formation of the Electrical Refrigeration Manufacturers' Council, which was promoted by J. Robert Crouse with the avowed purpose of bringing all manufacturers amicably together so that all might contribute to the common good by co-operation and friendliness.

In regard to the value of refrigeration load on the central-station line, the report stated that earnings will run from $125 to $175 per year per kilowatt of demand, depending upon the rate. The attractiveness of this type of load lies in the fact that it requires no additional line or capacity investment. Before giving its indorsement to any one particular type or make of machine, any central-station company should carefully inquire into the matter of time that the machine has been on the market, number of machines now in use, financial integrity of the manufacturer, the feeling of people who now use the machine, national distribution and national advertising, the ability of the manufacturer to co-operate in sales and service, and in general should be perfectly satisfied that any representations it may make regarding the refrigerator can be thoroughly backed up by the machine itself and by its maker.

So much has been written and said on this subject that it seems superfluous to mention it again. Its importance, however, justifies reiteration. Of all the so-called domestic socket devices, the refrigerator is in a class by itself. Depending on the rate for electricity, the earnings will run from $125 to $175 per year per kilowatt of demand. With little specific investment on the part of the central station to take care of it, these returns are most attractive.

Report of Sub-committee on Electric Cooking

COMMERCIAL cooking was the subject of a report by a subcommittee of the committee, A. M. Lloyd being the sub-committee chairman. The report contained photographs of typical commercial cooking and baking installations in actual operation, accompanied by data on each specific job. These data included equipment installed, connected load, maximum demand, consumption, bills, load factor, etc. Twenty-one cooking installations were considered, including hotels, restaurants, clubs, hospitals, bakeries, industrial kitchens and other places.

MORE and more the importance of developing markets for electrical energy that will enhance still further its popularity and make profitable the vast present and future investment in generating and distributing plants is coming to be appreciated. That with extension of transmission lines must concur the intensive development of the field already served is becoming an axiom of the industry. Load factor is an element of great moment in this commercial effort. Merchandising, however it is accomplished, cannot be neglected. Domestic appliances must be kept on the lines, sockets multiplied and servicing attended to. Cooking installations can be multiplied many times, and refrigeration looms as a young giant in the field. The Commercial Section is grappling valiantly with a huge task.

Technical Reports Numerous and Vital

Pitting of Water Wheels Studied—Substation Grounding Practice Outlined—Cable Installation and Joints Treated—Metering Methods and Tests — Coal and Ash Handling Methods Stated

THE technical workers in the light and power industry go directly at their problems and build up their reports by getting data and opinions and then digesting them. A glimpse at the reports presented this year shows that a vast amount of hard work and some very keen technical intelligence have been expended by the industry engineers. More and more they are working at their problems on the basis of perspective and economics. They are building according to a plan and put their brains to work on problems before they become acute. The reports this year are filled with very valuable data and thoughts.

C. F. HIRSHFELD
Chairman Technical Section

Report of Overhead Systems Committee

THE overhead systems committee, H. C. Sutton chairman, reported on the year's activities and printed with its report some extensive studies on engineering problems. This committee during the year printed a serial report on the comparative cost of steel tower lines and has completed the manuscript of a reference book on overhead systems that will supplement and bring up to date some of the material included in the handbook on overhead line construction published in 1914. Some of the major topics covered during the year were treated as special papers in the report. Other reports will be published soon in the form of serial reports on electrical problems of distribution, transformer loading and methods of sleet trouble prevention.

EXPERIENCE WITH TREATED AND UNTREATED POLES

A paper on service experiences with treated and untreated poles accompanied the report and was written by R. M. Wirka, engineer in forest products, United States Forest Products Laboratory, Madison, Wis. The author treated of several experimental lines in different parts of the country which used different kinds of wood poles and wood poles that had received different kinds of treatment. Some of these lines had been in service a long time and others only a short period, and a tabular presentation was made of the

H. C. SUTTON
Chairman Overhead Systems Committee

observed condition of the line in each locality. In Table I is given a typical example of the inspection performed on one line and shows the service record for this type of pole which had received different kinds of treatment. In addition the paper contains an appendix with a chemical analysis of the preservatives used on the different lines.

The author draws the following conclusions from the data on the different lines: (1) Untreated poles set green will generally give a longer life than untreated poles set after seasoning. (2) An open tank butt treatment with creosote is more effective than any other kind of treatment included in the experiment. (3) The choice between butt treatment and pole length treatment should depend upon the region in which poles are to be used. In many regions the upper parts of the pole do not decay rapidly and a good butt treatment will greatly extend the life of the pole. (4) A two-coat brush treatment is better than a single coat of the same preservative. (5) In general, poles given a two-coat brush treatment with carbolineum or creosote were in better condition than poles given brush treatments with other preservatives; but in one line the poles treated with three

TABLE I—CONDITION OF EXPERIMENTAL CHESTNUT POLES SET IN THE WARREN-BUFFALO LINE OF THE AMERICAN TELEPHONE & TELEGRAPH COMPANY AFTER ABOUT SEVENTEEN YEARS' SERVICE

Results of 1922 Inspection

Preservative	Treatment (Butts Only)	Condition	No. of Poles: Set	No. of Poles: In Test	No. of Poles: Eliminated	Sound: No.	Sound: Per Cent	Partly Decayed: No.	Partly Decayed: Per Cent	Removed on Account of Decay: No.	Removed on Account of Decay: Per Cent	Average Loss in Circumference, In.
Coal tar creosote	Open tank	Green	29	28	1	25	89.3	3	10.7	0	0	0.03
Coal tar creosote	Open tank	Seasoned	153	149	4	129	86.6	18	12.1	2	1.3	0.30
Avenarius carbolineum	Brush 1 coat	Seasoned	8	8	0	0	0	8	100.0	0	0	6.5
Avenarius carbolineum	Brush 2 coats	Seasoned	66	66	0	21	31.8	45	68.2	0	0	2.1
Coal tar creosote	Brush 2 coats	Seasoned	83	82	1	32	39.0	50	61.0	0	0	1.10
Creolin	Brush 1 coat	Seasoned	16	16	0	0	0	16	100.0	0	0	4.5
Creolin	Brush 2 coats	Seasoned	63	62	1	0	0	61	98.4	1	1.6	3.8
S. P. F. carbolineum	Brush 1 coat	Seasoned	10	10	0	0	0	10	100.0	0	0	5.2
S. P. F. carbolineum	Brush 2 coats	Seasoned	67	66	1	17	25.8	49	74.2	0	0	1.4
Wood creosote	Brush 1 coat	Seasoned	21	21	0	0	0	21	100.0	0	0	3.0
Wood creosote	Brush 2 coats	Seasoned	49	49	0	5	10.2	43	87.8	1	2.0	2.1
Coal tar	Brush 1 coat	Seasoned	48	48	0	0	0	48	100.0	0	0	4.7
.....	Untreated	Green	194	190	4	0	0	190	100.0	0	0	4.2
.....	Untreated	Seasoned	357	357	0	0	0	333	93.3	24	6.7	6.2

TABLE II—POLES TREATED, BY KINDS OF WOOD AND KIND OF TREATMENT, 1924

Kind of Wood	Full Pressure Treatment	Butt Treatment Only	Total
Cedar	1,023	1,015,328	1,016,351
Yellow pine	899,201	200	899,401
Chestnut		170,167	170,167
Redwood		142	142
Douglas fir	119		119
Total	900,343	1,185,837	2,086,180

The full cell, empty cell and open tank processes were used in the treatment of poles in 1924.

coats of spirittine gave a very satisfactory life. Although better results can always be obtained with an open-tank treatment, the experiments indicate that a satisfactory brush treatment is a good investment where a better treatment is impracticable. (6) Poles given an open tank butt treatment with zinc creosote were in better condition than poles given a similar treatment with zinc chloride alone.

The report also included a table from the 1924 annual report on quantity of wood treated and preservatives used in the United States in 1924, prepared by R. K. Helphenstein, Jr., in co-operation with the American Wood Preservers' Association. These data are given in Table II.

Live-Line Work Survey

A sub committee, with J. K. Hines as chairman, sent out questionnaires to about 250 persons representing a larger number of operating companies asking for answers to 23 questions on live-line maintenance and construction methods and tools. Of the 105 answers received, nine had no lines above 5,000 volts, three killed all lines for all work, 43 did their own construction and maintenance work on the lines while dead by means of duplicate sources of power to the customers on loop circuits supplied with sectionalizing switches, and 50 answers indicated that live-line maintenance is practiced. The answers show that voltages up to and including 140 kv. are worked upon while alive. The majority of the companies operating 6,600-volt lines do their work with rubber gloves and other rubber protective devices. Above 13.2 kv. tools of various types are used.

The majority of the companies do not recognize the work as any more hazardous than other classes of line work. The majority of the companies supervise the work from the ground, where the foreman or gang boss has a better chance to direct activities.

Ten companies report thirteen accidents, eleven of which were fatal, which is on the basis of one fatal accident every 19.4 years per company considering that the 50 companies report having done such line work a total of 213 years.

A study of the answers also indicates that the work is considered economical. However, economy is not the determining factor. Service and unnecessary duplication of lines are of far more importance.

Insulator Research Work

The long-time strength of insulators was the subject of a study of a sub-committee with R. J. C. Wood as chairman. The object of the investigation was to determine what relation, if any, exists between the ultimate mechanical strength of what are commonly called high-strength suspension insulators and the load they can sustain indefinitely without electrical failure or mechanical failure. It was intended to confine the experiment to 10-in. insulators having a minimum quick-time mechanical strength of 18,000 lb. Five insulator manufacturers furnished samples for the tests. During the test at regular intervals the insulators were tested electrically one at a time at 55 to 60 kv., 50 cycles, for about ten seconds each while under mechanical load. The exact time of electrical failure is not known, the length of electrical life being taken to the time at which electrical failure was first noted. Quick-time tests were made upon samples of each manufacturer at the time the long-time tests were first started. After making the quick-time test upon units that had been loaded to 9,000 and 11,000 lb. for 11,000 hours, quick-time tests were made upon units that had been in storage since the beginning of the tests. The conclusions to be made from the tests were, first, the quick-time ultimate mechanical strength cannot be relied upon as a criterion upon which to base working load, the relations between the two depending upon either design or material, or both. The second conclusion is that more than one manufacturer can supply 10-in. insulators that will apparently sustain from 11,000 to 13,000 lb. dead load for very long periods of time and it is safe to use them up to 6,000 lb. dead load on long-span transmission lines. The third conclusion is that if incipient mechanical failure occurs at the time of electrical failure under load, it will probably be followed by complete mechanical failure at some subsequent date without increase of load. The forth conclusion is there is some indication that at some period during the long-time test of 11,000 hours the ultimate mechanical strength of all insulators loaded to 9,000 and 11,000 lb. decreased about 7 or 8 per cent. Great caution must be observed, however, in generalizing from tests made upon an aggregate of only 83 insulators.

Porosity of Porcelain Insulators

A second subject of investigation was to determine what pressure and length of time of its application were necessary to show up porosity in insulator porcelain. Tests were made that brought out the following conclusions: (1) Ware of the description and dimensions experimented with becomes non-porous to pressures up to 25,000 lb. per square inch maintained for 48 hours at a firing temperature corresponding to about cone No. 5. (2) A difference of about half a cone in firing temperature makes the difference between non-porous and porous porcelain. (3) There is not enough evidence to establish a definite relation among pressure, time and penetration, as the slight differences observed may well be due to small differences in porosity of the specimens themselves. (4) There appears to be small danger of porous porcelain in insulators made of such ware as was furnished for these tests, as the factory firing schedule is several cones higher than the point of non-porosity. (5) Detection of porosity by temperature rise or power loss in a high-frequency field appears to be a promising method.

TABLE III—SUMMARY OF MECHANICAL STRENGTHS ON INSULATORS

Series	Before Loading	After 9,000 Lb.	Per Cent Change	After 11,000 Lb.	Per Cent Change	After Storage Without Load	Per Cent Change
100	19,758	19,540	—1.10	17,978	— 9.01	18,562	—6.06
200	17,316	15,635	—9.71	16,818	— 2.88	18,092	+4.48
400	23,615	21,772	—7.81	20,658	—12.52	25,665	+8.62
500	24,862	23,245	—6.51	24,515	— 1.40	25,735	+3.51
600	17,680	17,188	—2.78	16,642	— 5.87	17,125	—3.14
Average...	20,646	19,476	—5.67	19,322	— 6.34	21,036	+1.84

Report of Electrical Apparatus Committee

THE electrical apparatus committee, with E. C. Stone as chairman, has been working on several major objectives during the year. These were: Co-operation with the electrical apparatus committees of the various geographic divisions for mutual advantage, preparation of reports on engineering studies, study of important subjects through prepared discussions and meetings of the committee, improvements in the adequacy of electrical apparatus available for use on power systems through intensive study of service conditions and requirements.

TABLE I—STANDARD INTERRUPTING CAPACITY RATINGS OF OIL CIRCUIT BREAKERS AT 15,000 VOLTS OR BELOW FOR POWER HOUSE INDOOR SERVICE

Arc Amperes	Rated Volts	Arc Kva.
2,500	4,500	20,000
2,000	7,500	25,000
1,500	15,000	40,000
2,500	15,000	65,000
3,500	15,000	90,000
5,000	15,000	125,000
7,000	15,000	175,000
10,000	15,000	250,000
14,000	15,000	350,000
20,000	15,000	500,000
30,000	15,000	750,000
40,000	15,000	1,000,000
60,000	15,000	1,500,000
100,000	15,000	2,500,000

One of the features of the work was the publication of the relay handbook, which is a very authoritative book on this topic and is in great demand by the industry. Four other serial reports were published during the year and three others are in preparation. Brief conclusions on some special engineering studies made by the committee are as follows: Continued operation of old and the installation of new outdoor substations in built-up districts confirm the opinions that outside installations in built-up districts are satisfactory, from the standpoint of safety both to the public and to the apparatus itself if proper precautions are observed.

A number of companies have found it necessary to abandon fuse protection of direct-current feeders supplying heavy low-tension networks in favor of some form of circuit breaker protection at the outer end of the feeder and where practicable also at the substation end of the feeder. Regulations governing the connection of motors to a power system must be based upon system rather than upon motor conditions, in the opinion of the committee. The N.E.L.A. rules in their present form operate to encourage overmotoring and consequent increase of voltage

E. C. STONE
Chairman Electrical Apparatus Committee

disturbance rather than the desired opposite result. Motor rules improperly formulated will take account of effect in changes in illumination that are experienced by persons working under artificial illumination supplied from the source from which the power supply is taken.

The present practice of motor protection by the use of instantaneous low-voltage relays is not satisfactory. Probably the severest criticism of the industry from its customers comes from the operation of these devices at times of system disturbance. Constructive suggestions are offered for improving this motor protection situation.

Relative ratings for the interrupting capacity of oil breakers at the various operating duties to be encountered in practice have been agreed to by the apparatus committee and the Electric Power Club. A table of recommended uniform ratings for the interrupting capacity of oil circuit breakers at 15,000 volts or below has been submitted, which should materially simplify practice in the use of breakers within this range.

In a study of system disturbances it is found that lightning caused the highest voltage surges encountered and that these were frequently of a magnitude of ten times normal. Switching either on open wire or cable systems did not indicate any severe overvoltage, values higher than two and a half times normal being rare and the maximum being four and six-tenths times normal. An investigation of the performance of 4,969 reactors in operation at voltages up to 27,600 indicated only 37 failures.

Studies of system stability have been made during the year. This is a very important subject that requires still more intensive study. The formation of sludge in oil-immersed transformers has reached serious proportions on some systems and has received serious consideration from the committee. Devices for changing the ratio of transformers, particularly under load conditions, are being used more and more and a serial report on this subject is contemplated.

The committee is very positive in believing that the national electric code and the national electrical safety code provide all the codes that are necessary for the guidance of the electric light and power industry. It states that any revisions or amplifications in codes that are desired by any group in the industry should be presented to the American Engineering Standards Committee for inclusion in one of these codes. The preparation of specifications for purchase has gone on apace, and such items as fire extinguishing, radio communication and fractional horsepower motors have been studied very carefully.

Report of Committee on Pitting of Hydraulic Turbine Runners

PITTING of hydraulic turbine runners was dealt with in the report of the hydraulic power committee. The principal factors influencing pitting were found to be the height of runner above tailwater, the draft due to the average velocity at the throat of the runner, the design of the runner as to bucket size, angle and curvature as affecting the local tendency of the stream to pull away from the bucket, and the design of the draft tubes. A change of any one of these factors may be the means of avoiding or reducing pitting.

From an operating standpoint higher speed, higher head or greater capacity; lowering of the tailwater or improvement of the draft-tube efficiencies, and finally—that which is most important in high heads—operation at gate openings other than those resulting in the best distribution of velocity, all contribute toward pitting. Pitting is not confined to any one class or type of turbine runner and within the range of usage up to the present time does not depend to any great extent upon the kind of metal used.

Pitting may be avoided by a lower wheel setting or by any other method which reduces the draft head at the point where pitting occurs. Pitting on existing runners may be minimized by building up the affected areas by the electric arc welding process, using a metal that resists corrosion better than

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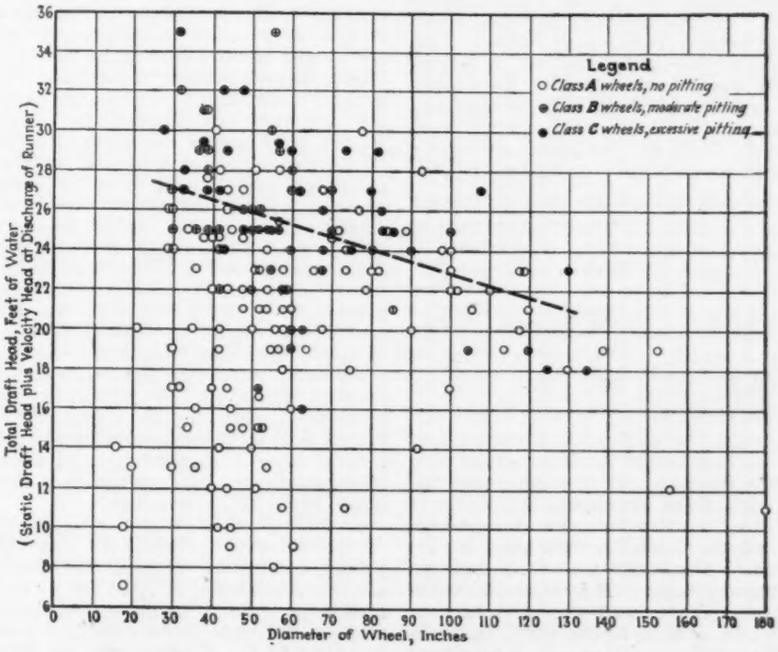
Chairman Pitting of Turbines Committee

the original metal. The practice of drilling holes through the runner vanes from the pressure side to the vacuum side in the region where pitting has occurred, with the idea of relieving the vacuum on the lower side of the bucket, is yet indeterminate in its effects as reported by one company, while other companies are outspoken in their opinions of the merits of this experiment. The evidence is held by the committee not to be conclusive. In the opinion of the committee it is the presence of oxygen in the water which is the active agent in the pitting process. Whether



RESULTS OF SURVEY OF WATERWHEEL PITTING

TABLE I—CHARACTERISTICS OF TURBINE INSTALLATIONS SHOWING EXCESSIVE PITTING

Wheel No.	Metal	Nominal Diam.	Throat Diam.	R.p.m.	Hp.	Head	Type of Draft Tube	Years in Service	Spec. Speed	Static Draft Head	Veloc. Head at Throat	Total Draft Head
4 H	Steel and cast iron	43	51	225	1,130	40	Straight steel	9	75	25	7	32
22 H	Cast iron	33	41	257	575	39	Straight steel	3	63	23	4	27
23 H	Cast iron	39	48	200	710	39	Straight steel	3	55	23	4	27
24 H	Cast iron	48	58	200	860	39	Straight steel	3	60	23	2	25
44 H	Cast steel	42	49	257	1,600	56	¼ turn	2	67	19	8	27
59 H	Bronze	43	33	450	2,650	210	¼ turn	3	29	16	8	24
60 H	Cast steel	43	33	450	2,650	210	¼ turn	1	29	16	8	24
63 H	Bronze	35	36	458	1,315	100	¼ turn	2	52	11	6	17
94 H	Bronze	33	35	400	1,125	78	Steel cone	3	58	20	8	28
100 H	Cast steel	42	42	514	6,400	320		12	30	20	7	27
101 H	Bronze	44	40	514	6,400	320	Curved	9	30	20	9	29
154 H	Bronze	38	42	450	3,750	125	Steel and concrete cone	13	66	13	16	29
155 H	Steel and cast iron	48	52	200	1,575	36	Steel cone	13	90	17	15	32
157 H	Steel and cast iron	28	27	600	1,500	186	Steel cone	12	34	23	7	30
188 H	Bronze	32	36	375	1,775	85	Steel cone	13	61	20	15	35
201 V	Bronze	35	32	500	5,175	240	Cone	2	38	19	25	44
210 H	Cast iron	30	31	400	820	123.5	¼ turn	5	28	8	3	11
							Average total draft head, runners up to 48 in. diam					27.5
3 H	Steel and cast iron	57	70	200	4,000	65	¼ turn	8	69	20	9	29
15 V	Cast iron	80	100	100	2,750	40	60° turn	5	52	24	3	27
27 H	Cast iron	58	45	360	5,000	250		7	26	17	5	22
39 V	Cast iron	57	62	133	900	34	Reverse curve	15	49	22	3	25
36 H	Bronze	60	50	300	8,000	233	¼ turn steel	9	30	18	11	29
50 V	Cast iron	75	78	185	10,000	96	¼ turn	6	62	8	16	24
58 V	Bronze	62	60	360	15,000	315	¼ turn	3	33	17	10	27
62 V	Cast steel	79	68	257	14,700	240	Hydraucone	3	33	12	10	22
82 H	Cast steel	68	52	360	11,500	440	¼ turn	6	19	21	5	26
135 H	Cast steel	74	76	200	9,300	125	¼ turn concrete	6	46	20	9	29
144	Cast iron	59	53	.....	10,000	265		4	..	9	10	19
145 V	Bronze	59	53	.....	10,000	265		2	..	9	10	19
160 V	Cast iron	82	68	240	14,500	204	Hydraucone	3	37	16	13	29
203 V	Bronze	64	46	428	20,500	515	Straight cone	4	25	16	20	36
226 V	Cast iron	86	103	144	11,000	76	Curved	9	67	15	10	25
							Average total draft head, runners 48 in. to 96 in. diam					25.9
13 V	Cast iron	130	156	100	24,000	70	Hydraucone	1	77	12	11	23
204 V	Cast steel	125	110	187.5	52,500	305	Moody	2	34	7	11	18
219 V	Bronze	108	113	154	27,000	165	Curved	8	43	18	9	27
							Average total draft head, runners over 96 in. diam					22.7

the action is entirely chemical or is at least partly mechanical or electrochemical, the committee is not prepared to say.

Data were obtained on 225 hydraulic units and these were grouped in a no-pitting classification, a moderate-pitting classification and an excessive-pitting classification. In the tabulation where excessive pitting was found there were 35 wheels and in the moderate pitting classification 51 wheels. All kinds of metals and draft tubes were listed in the compilation and a wide range in heads and horsepower was to be found. A study of the results shows the average total draft heads for the different groups of wheels decreasing with an increase of the size of the wheel. It shows a definite decrease in the average limiting draft head toward the larger wheel. The accompanying graph shows in appropriate symbols the data of the tables. The rate of pitting, total draft head and diameter of wheel are given for each runner. While at first glance the points appear to be widely scattered, a close

TABLE II—AVERAGE TOTAL DRAFT HEADS SHOWING NO MODERATE AND EXCESSIVE PITTING

Size of Wheels, Diameter	No Pitting, Ft.	Moderate Pitting, Ft.	Excessive Pitting, Ft.
Up to 48 in.	19.0	24.9	27.5
48 to 96 in.	16.2	23.9	25.9
Over 96 in.	19.0	20.6	22.7

inspection shows them to be more consistent than might be expected in view of the character of the data and the omission from consideration of many variables in the list, minor in effect, but which should nevertheless be included to obtain the true draft head on the runner blades. It is seen that when the total draft head executed exceeds a certain critical figure there is likelihood of serious pitting. It is also seen that when the total draft head is low it is almost certain that the runner will not pit, and, last, that there is a definite reduction in safe total draft head allowable in larger wheels as compared with the smaller wheels.

Report of Hydraulic Power Committee

THE hydraulic power committee, with R. L. Thomas as chairman, presented a general report and outlined the serial reports that will be developed in the future because of the continuity of work that has been followed during the past few years. A striking feature of the work this year is a report on the reliability of hydroelectric units covering the operating records of 56 units in comparison with the record of 87 steam units published by the prime movers committee. The greater reliability of hydraulic, including auxiliary equipment for water supply, is shown by the average outage of 5.6 per cent for hydraulic units as compared with 12.9 per cent for steam units. A progress report was completed on forecasting water supply in the form of a statement by Dean John F. Hayford. An equation was formulated for runoff dependent on rainfall, temperature, wind velocity, humidity and certain constants peculiar to a particular drainage station. Another interesting paper by Roy Wilkins discusses vibrations in hydraulic machinery. Other topics discussed are restrictions in flow due to vegetable and animal growth in conduits and an investigation on the evaporation from lakes, by N. W. Cummings.

In 1924 F. C. Rawlston as chairman of the sub-committee of the hydraulic power committee investigated hydroelectric units rated at 2,500 hp. or more at a head of 50 ft. or more, or utilizing at least 500 cu.ft. per second and heads less than 50 ft. No limit was set to the age of units to be included in the study. The data on this study have been completed and in addition, starting with October, 1925, with R. L. Thomas as chairman of the sub-committee, investigations were made on units of at least 5,000 kw. rating installed since Jan. 1, 1920. The data on investigations started in 1925 are not yet complete and the information presented largely applies to the data of the 1924 investigation.

The 1924 performance data of 56 hydraulic units is summarized in Table I, which also shows for the sake of comparison the 1923 data for 87 speed units as fitted in the prime movers report. The sizes of the waterwheels reported range from 3,750 to 44,000 hp., and the steam units range from 18,000 to 60,000 kw.

The average outage time of the 56 hydraulic units is only 5.4 per cent, as compared with 12.9 per cent for 87 steam units, and the hydraulic units' service demand availability factor is 98 per cent, as compared with 92.3 per cent for the turbo-generators. This is in spite of the rather surprising fact that the hydraulic units were operated more nearly continuously than the steam units, the service time of the former being 77 per cent and of the latter 77.4 per cent. The maximum possible service time of the hydro units is 94.6 per cent and of steam 87.1 per cent. These figures are based on the assumption that the outage time would not be increased if the units were operated for the entire reserve time, which, of course, is not strictly correct.

The hydraulic units seem to run more lightly loaded than the steam units, the output factors being 62.4 per cent and 71.3 per cent respectively. This fact is partly offset by the greater service time of the hydraulic units, and the capacity factor of the hydraulic units is 48.1 per cent, as compared with 51.6 per cent for steam units. In both cases the annual output is not very different

TABLE I—SUMMARY OF OPERATING RECORDS OF HYDRO UNITS

Units	Hydraulic Units—1924 Impulse Wheels	Reaction Turbines	Installed Before 1920	Installed 1920 or Later	All Hydraulic Units	Steam Units 1923
1. No. of units included	8	48	21	18	56	87
2. Av. turbine rating, hp.	10,080	18,070	12,160	19,170	16,930	38,600
3. Service time, per cent	51.39	81.25	75.34	73.02	76.98	72.4
4. Idle time, per cent	48.61	18.75	24.66	26.98	23.02	27.6
5. Outage time, per cent	3.55	5.73	4.66	7.87	5.40	12.9
6. Outage time when in demand, per cent	.41	1.87	3.15	1.28	1.67	6.0
7. Outage time when not in demand, per cent	3.14	3.86	1.51	6.59	3.73	6.9
8. Reserve time (4—5), per cent	45.06	13.02	20.00	19.11	17.62	14.7
9. Demand time (3+6), per cent	51.80	83.12	78.49	74.30	78.65	78.4
10. Max. possible service time (3+8) or (100 per cent —5)	96.45	94.27	95.34	92.13	94.60	87.1
11. Capacity factor, per cent	16.5	51.5	51.3	40.1	48.1	51.6
12. Output factor, per cent	32.2	63.3	68.1	54.9	62.4	71.3
13. Service demand availability factor, per cent	99.59	97.75	96.75	97.86	98.02	92.3

from one-half of the continuous use of the rated capacity.

A comparison of impulse wheels and reaction turbines is interesting but not conclusive, first, because of the small number of impulse wheels included, and second, because of the abnormal conditions under which the impulse wheels operated in 1924. All of the eight wheels reported are located in California and the effect of the unprecedented drought is clearly shown in the figures for service time, capacity factor and output factor.

A comparison of the units on the basis of age, as shown by the third and fourth columns of Table I, is interesting as well as surprising. In a number of reports old and new turbines were combined in one return, making it impossible to classify these units by age. It may be noted that the older units installed before 1920 have greater service time, demand time, capacity factor and output factor and less outage, but more outage when in demand and a lower availability factor.

An analysis of the causes of outage of hydro units is presented in Table II,

TABLE II—ANALYSIS OF CAUSES OF OUTAGE OF HYDRO UNITS IN PER CENT OF TOTAL OUTAGE TIME

	Impulse Wheels	Reaction Turbines	All Hydraulic Units
Number of units included	8	44	52
General Hydraulic Causes			
Ice or trash	3.2	2.2	2.3
Floods	....	....	....
Penstock or canal	23.3	2.0	4.2
Headgates or intake	1.2	4.0	3.7
Other general hydraulic	....	1.8	1.6
Total general hydraulic	27.7	10.0	11.8
Waterwheels and Auxiliaries			
Runner	....	19.7	17.7
Turbine valve	....	4.3	3.9
Turbine gates	....	.7	.7
Guide bearings	3.9	4.0	4.0
Thrust bearings	....	.7	.6
Governor and governor system	.6	1.0	.9
Pressure regulators	.1	.3	.3
Draft tube	....	2.0	1.8
Lubricating system	....	2.7	2.4
Inspection	8.5	1.7	2.4
Other causes	2.4	21.5	19.5
Vibration	....	....	....
Construction	....	....	....
General overhauling	....	1.6	1.5
Total waterwheel	15.5	60.2	55.7
Generators and Appurtenances			
Vibration	....	....	....
Lubric. or oil leakage	....	3.4	3.0
Rotor or field	17.1	.4	2.1
Arm, iron or windings	23.2	13.2	14.2
Exciter and rheostats	.2	.6	.6
Ventilation system	....	....	....
Cleaning	.1	7.5	6.7
Inspection	11.3	.4	1.5
Other causes	.1	.6	.6
Brushes	....	....	....
Total generators	52.0	26.1	28.7
Electrical Causes Beyond Generator			
Switches	....	.3	.3
Bus	3.8	1.1	1.3
Transformers	.3	1.3	1.2
Outside, transm. etc.	.7	1.0	1.0
Total beyond generator	4.8	3.7	3.8
Total from all causes	100.0	100.0	100.0
Total outage in per cent total time (from Table I)	3.55	5.73	5.40

R. L. THOMAS
Chairman Hydraulic Power Committee

expressed in per cent of the total outage time shown as item 7 in Table I. Reports for four units were incomplete, so this tabulation covers only 52 units.

In the case of the average of all units and also of reaction turbines, more than half the outage is caused by the wheels or their auxiliaries, with the runner as the largest single cause. The generator division comes next, with the armature as a second largest single cause. In the case of impulse wheels, however, the generator division causes more than one-half the outage and the waterwheels and their auxiliaries cause only 15.5 per cent of the total outage. These figures cannot be taken as conclusive, however, for the reasons previously given—that is, the small number of impulse wheels reported and the abnormal conditions prevailing in California in 1924.

VIBRATION IN HYDRAULIC MACHINERY

In an able paper Roy Wilkin discussed vibration in hydraulic machinery under different classifications. One of the inherent characteristics of a reaction turbine is that the pressure on the leading side of the runner inlet should be higher than that on the trailing. It is usually the case that the pressure at the top of the vertical turbine runner is higher than the simultaneous pressure at the bottom. On several turbines explored this difference in pressure varies from as high as 15 per cent of the head to only 4 or 5 per cent.

This variation in pressure presents to the incoming flow a varying back pressure like teeth of a gear, and this results in a change in velocity of the incoming water. Different combinations of guide and runner vanes cause different combinations of these impulses to show in the scroll-case and penstock, those in which the individual impulses add being the most severe. Certain combinations of the number of guide and runner vanes tend to neutralize by virtue of their different phase and so make a comparatively quiet running turbine, even though the reaction is high.

WATER AS A BUFFER

Clearances between runner and guide vanes interpose between the runner and the entering water a ring of water serving as a sort of buffer or equalizer for the pressure variations presented by runner inlets. On turbines in use it will sometimes materially decrease the vibration and increase the efficiency to cut back arbitrarily the runner inlets and increase this clearance. On machines that were examined the shape of the guide vanes and the thickness of the runner vanes apparently have very little effect on this type of vibration. The fact of continued vibration is not known except that any vibration at such frequencies as 25 to 400 cycles of this periodic type is felt to be detrimental to both the concrete and the metal subjected to it. The loss in efficiency, although usually not great, is apparent on a careful test.

The type of vibration that is nonperiodic manifests itself by pumping of sudden pressure changes and may be as high as 20 to 30 per cent of the total head, though usually much less, and causes rather severe disturbances. In the turbines tested there was a residual whirl in the water in the draft tubes which reversed at some critical point in gate opening. In most turbines the flow through the draft tube is not uniform and may in certain parts of the draft tube at some loads reverse and flow toward the runner. This is easily investigated by a sort of weathervane thrust in the side of the draft tube and traversed across it for different loads.

These changes in direction cause sudden breaks in all or part of the vacuum in the draft tube with a resulting slap of water against the runner or other surfaces or against other forces of water, which result in a sort of water hammer apparent as a sudden pressure rise through the turbine and back up to the penstock. These pressure rises are usually too sudden for the average pressure gage to record. In the penstock these pressure rises are dampened and lengthened and are apparent as a sort of breathing action. Air in the water in any considerable quantity causes sharp cracking noises as it expands in the draft tube and corresponding pressure rises. Turbines

that are designed for certain heads but are operated under greatly different heads are naturally more prone to such disturbances than those operated close to the heads for which they were designed. One such case gave approximately 20 per cent greater output when throttled to its design head than when operated at a higher head, due to the fact that it was impossible to operate a full gate opening on the higher head on account of vibration.

A third type of vibration is due to mechanical unbalance and is so pronounced that it is impracticable to run with the runner openings blocked. In most cases it is so apparent that immediate shutdown is necessary. Such unbalance is apparent once per revolution and has not the sharp impact characteristics of the two other types.

Report of Meter Test Schedules Committee

PERIODIC test schedules for watt-hour meters and methods for recording results were discussed in the serial report of the meter committee. Test periods for watt-hour meters were found to vary from two to twelve years for the 5-amp. to 25-amp. single-phase class of meters. In the table are given the periodic test schedules of state regulatory bodies, and it is seen that they are not at all uniform. A survey also showed that the recording methods were not uniform and some of them not at all comprehensive. Records properly kept often disclose important information from which the wide-awake meterman may profit, and they provide means of showing to the executives and other industries at a glance what the meter department is doing. A typical test record sheet is presented as adaptable to the types of records that should be kept. If the test records are plotted on a graphic chart, the practice should be to bring all meters within the limits of 98 per cent and 102 per cent, and the appearance of such a graphic chart will aid largely in determining the test periods to be used.

COMPARISON OF STATE REQUIREMENTS OF TIME PERMITTED BETWEEN PERIODIC TEST INTERVALS FOR SINGLE-PHASE ALTERNATING-CURRENT METERS NOT EXCEEDING 25 AMP. IN CAPACITY

State	Months Between Tests	Rules Adopted
Arizona	24	1915
Alabama	48	1925
Colorado	36	1917
Connecticut	36	1915
District of Columbia	48	1925
Illinois	48	1921
Indiana	36	1920
Maryland	36	1916
Michigan	36	1922
Missouri	24	1915
Montana	36	1921
Nevada	12	1911
New Hampshire	24	1914
New Jersey	30	1913
New York	48	1925
North Dakota	36	1920
Oklahoma	48	1922
Oregon	36	1914
Pennsylvania	36	1914
South Carolina	24	1922
Washington	24	1912
West Virginia	36	1916
Wisconsin	48	1922

PERIODIC TESTS
AS FOUND WATTHOUR METER ACCURACY

TEST SCHEDULE			FULL LOAD __ % OF METER CAPACITY									
	METER CAPACITIES	TEST PERIOD MONTHS	NO OF METERS TESTED	NOT REC	94 -	94 + TO 96	96 + TO 98	98 + TO 100	100 + TO 102	102 + TO 104	104 + TO 106	106 +
SINGLE PHASE	25 AMPS AND LESS											
	__ TO __ AMPS											
	OVER ____ AMPS											
	TOTALS											
POLY PHASE	25 AMPS AND LESS											
	__ TO __ AMPS											
	OVER ____ AMPS											
	TOTALS											
DIRECT CURRENT	25 AMPS AND LESS											
	__ TO __ AMPS											
	OVER ____ AMPS											
	TOTALS											
	LIGHT LOAD __ % OF METER CAPACITY											
SINGLE PHASE	25 AMPS AND LESS											
	__ TO __ AMPS											
	OVER ____ AMPS											
	TOTALS											
POLY PHASE	25 AMPS AND LESS											
	__ TO __ AMPS											
	OVER ____ AMPS											
	TOTALS											
DIRECT CURRENT	25 AMPS AND LESS											
	__ TO __ AMPS											
	OVER ____ AMPS											
	TOTALS											

STANDARD DATA FORM FOR UNIFORM RECORDING OF PERIODIC TEST RESULTS

Report of Meter Committee

THE meter committee, under the direction of A. G. Turnbull as chairman, has endeavored to work along certain definite lines as determined from a study of the requirements of the industry. It has organized on a national basis and on a geographic division basis to get work done along sixteen major topics. Some of this work has been completed, and this year a serial report was printed on periodic test schedules for watt-hour meters and methods for recording results. Other reports that are well under way will deal with the education of meter men, the standardization of instrument transformers and meters, method of metering proposed low-tension alternating-current network and supervision of meter testers.

The handbook for electrical meter men has received a world-wide recognition and more than 12,000 copies have been disposed of. Work has been done on the revision of the American code for electricity meters, and some very splendid work has been done in regard to improving the rules of regulatory bodies. One of the striking developments in meter work has been the steady growth in the number of schools that have been giving meter courses. During the school year 1924-25 there was a total attendance of more than 1,100 students at 22 short meter courses held throughout the country. During this year it is estimated that more than 27 universities will give these courses. With the evidence accumulated through this work a sub-committee is preparing a serial report on education that should be of great value to those engaged in this class of work. It is expected that several serial reports on other topics will be produced in the near future, and a definite program has been laid out for work of meter men in all geographic positions and for the national committee whereby there will be continuity in effort.

A. G. TURNBULL
Chairman Meter Committee

Report of Electrical Apparatus Committee

"SYMBOLS for One-Line Wiring Diagrams" was the title of a report presented by the electrical apparatus committee. The symbols offered were carefully selected and are representative of the prevailing practices among the light and power companies of this country. They are offered as a suggested basis for obtaining greater uniformity in one-line wiring diagrams. In selecting the symbols consideration was given to the representative American practices as indicated by a canvass of 26 large companies. It was desired to get something simple in design in order to facilitate easy and rapid drafting and also to get symbols adaptable to the addition of supplemental descriptive notes and secondary or qualifying modifications in order to indicate specific characteristics and usual varieties of the devices. It was desired in addition to get symbols representative of the general physical appearance of the apparatus as far as practicable and to make the symbols conform with symbols set up by other qualified investigators when they did not conflict with the principles outlined previously. The symbols are kept to a minimum and are representative only of the apparatus usually met with in power engineering. The alternating-current rotating-apparatus symbol is based on the fundamental of the circle for rotating apparatus and is practically in general use both here and abroad. Winding connections are usually indicated by the use of a delta or other vector within the circle. The symbol for direct-current rotating apparatus is based also on the circle, but with the addition of tangential lines indicating pressures. The basic symbol for power transformers is used, and in the interest of simplification three-phase transformers are indicated with five V's in each winding and single-phase transformers with three V's in each winding. The winding connections may be indicated by vectors placed at one side of the basic symbol.

Other proposed symbols are reproduced in an accompanying graph.

ALTERNATING-CURRENT GROUNDING PRACTICES

Another serial report of this committee dealt with practices and methods in alternating-current grounding. A survey was made of the grounding practices followed by 50 representative power companies in all sections of the United States. The survey showed that grounding practices at indoor and outdoor substations do not differ materially. Water-piping systems afford by far the best grounding systems obtainable and should be used for grounding purposes wherever possible. Where no water system is available it is the practice to resort to artificial grounds such as pipe or plate grounds. The tendency is away from the use of plate grounds and toward the greater use of pipe grounds, owing principally to the fact that in most cases the same results can be obtained with pipes at a much less expense than with plates. Multiple pipes provide a well-distributed ground and have advantages over other types of buried grounds in that they are more economical, are more easily installed, allow for convenient inspection and test since connections can be made above the ground, provide a distributed ground over a considerable area when used in multiple, and are capable of reaching depths of 20 ft. or more when necessary to reach proper moisture level.

R. A. HENTZ
Chairman Grounding A.C. System Committee

It is general practice to use a common grounding system for all grounding purposes such as safety grounds, lightning-arrester grounds and neutral grounds on transformers and rotating machines. In the installations of such a grounding system the ground pipe or electrode should be placed as close as possible to lightning arresters, oil circuit breakers, power transformers and other pieces of equipment to be grounded, and all bonded together with a bare stranded copper conductor of at least No. 0 gage, which should be carried about the station as a ground bus to which all apparatus to be grounded should be connected. Each piece of equipment should be connected to the ground bus by a direct individual connection which should be large enough to carry the maximum short-circuit current which may be imposed on the ground connection. The general practice in both indoor and outdoor substations is to ground all non-current-carrying metal parts of equipment.

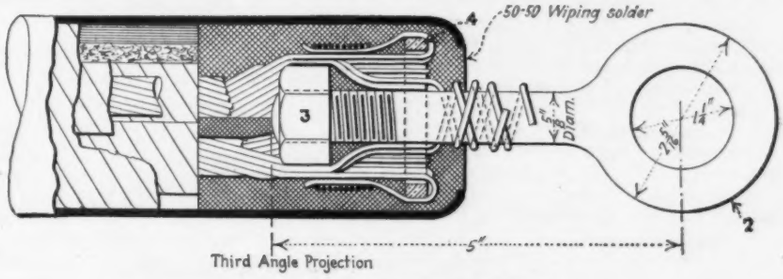
Grounding practices upon which agreement is not so general are grounding of substation fences, connection of overhead-line ground wires to the substation ground and special consideration of grounding disconnecting-switch operating handles. Detailed discussions of these points are made, and in appendices valuable data on grounding practice are made available.

Report of Underground Systems Committee

CABLE installation was the subject of a serial report issued by the underground systems committee. A survey of conditions shows that in the ordinary installations of cable no serious electrical harm can be done the cable without there being visible mechanical injury. One manufacturer concludes that a net value of 40 per cent of the tensile strength is a satisfactory basis for figuring the maximum stress value. Another manufacturer had samples of cable which had been previously tested and to which a pulling eye was properly attached subjected to stresses up to 10,000 lb. without any deleterious effects on the electrical test values of the cable. Another operating company in its recent installation of single-conductor, 750,000-circ.mil, 75-kv. cable has measured the stress on practically every length installed, and the results obtained show that in no case was a stress in excess of 5,000 lb. exerted. Nearly all of this cable was installed in 5-in. concrete ducts, and the cable was pulled by means of wire grips or soft-drawn steel wire laced onto the cable after the ends had been prepared by bendings each strand separately back on itself and filling the end of the cable with solder so that the lead sheet and the copper conductor were pulled as one. Other operating companies reported pulling cables with stresses under 5,000 lb. in different types of ducts without harm.

Report of Prime Movers Committee—Coal and Ash Handling

HANDLING of coal and ashes was discussed by the prime movers committee in a serial report. Several new installations are described in the report, and a survey of the industry indicates a distinct trend toward the use of the rotary car dumper for unloading railroad coal cars and the hydraulic sluice for handling ashes. Moreover, the use of the drag scraper for storage of coal is increasing its popularity. The new Crawford Ave-



1	Brass			4	Ring $1\frac{7}{8}$" x $1\frac{5}{8}$" diam. x $\frac{5}{16}$" wide
1	Steel			3	Nut, hex. $\frac{3}{8}$"-11"
1	Steel			2	Eye bolt
+				1	Assembly
6-1	6 Mo.				Pulling Joint (Buffalo type)

DETAILS OF A PULLING EYE RECOMMENDED BY A CABLE MANUFACTURER FOR 75-KV. CABLE

nue station of the Commonwealth Edison Company receives its coal by rail, and this coal is then unloaded by means of a combined car dumper and scale. The coal is removed from the car dumper by means of a belt conveyor which discharges into the storage belt or the belt leading to coal breakers. Coal from the breakers is elevated on an inclined belt which discharges onto the main house belt. A traveling tripper on this belt transfers the coal to the belt over the individual bunkers. When coal is placed in storage, coal from the dumper belt is transferred to a belt running the length of the storage yard, and a movable stacker places the coal in piles on either side of the belt. When taking coal from storage, the belt is run in the opposite direction, and a gantry crane equipped with a grab bucket is used to move the coal from the storage pile to the belt conveyor.

In the South the Warrior steam plant of the Alabama Power Company has been equipped with a coal preparation plant to handle the low-grade coal used. This plant consists of simple jigs, with the necessary handling equipment, and reduces the ash and sulphur content of the raw coal about 50 per cent. The cost of operating this washer, including maintenance, for the year 1924 was 5.4 cents per ton of coal. The loss in weight of coal in washing is 14 per cent. The maximum average continuous rating for the boiler furnace equipment using the raw coal was 135 per cent, and with the prepared coal the average continuous rating was 180 per cent.

The Iowa Railway & Light Company has developed a means of distributing the coal more uniformly in the storage bunkers. This device consists of two steel-plate chutes of an inverted-V shape mounted on a vertical shaft which is rotated either by hand or by a motor at a suitable speed. The chutes are placed at an angle of 45 deg. and made with one leg long and the other short. The distributor is immediately under the stream of falling coal from a conveyor, thus spreading the fuel evenly to all parts of the bunker.

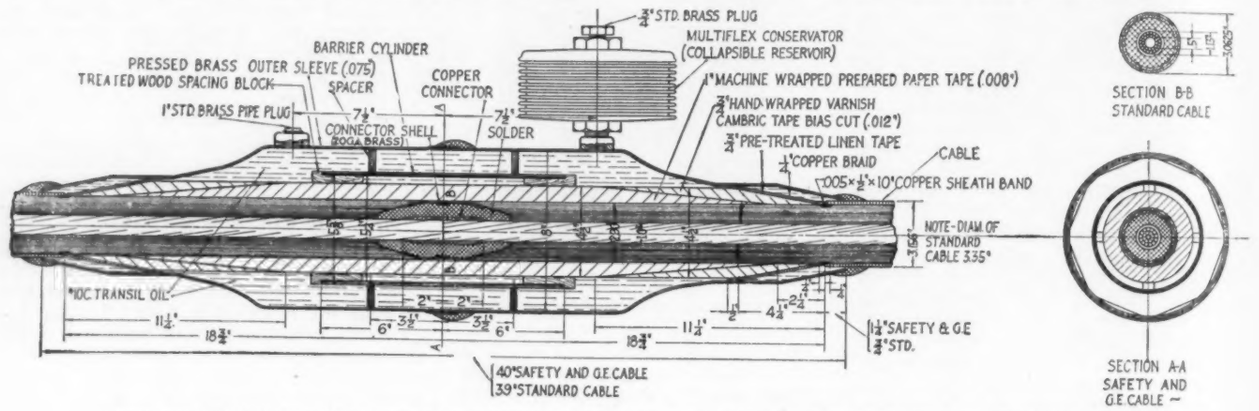
The Public Service Electric & Gas Company made tests on four cable drag scrapers for handling fresh coal. The average kilowatt power per loaded bucket varied with the four scrapers from 83.73 as a minimum to 105.42 as a maximum. Very satisfactory results were obtained with the drag scraper. The Columbia Power Company at its new Columbia station on the Ohio River receives coal either by rail or from barges on the river. The coal received by rail is unloaded to a track hopper which is so built that it will accommodate a rotary car dumper for future installations. From this hopper the coal is fed to a 42-in. belt conveyor by means of a reciprocating feeder. This conveyor will deliver the coal to a junction, where it will be transferred to another 42-in. conveyor which leads to the crusher house. A steel tower and grab bucket is used for unloading the barge coal. The grab bucket discharges the coal into a receiving hopper, from which it is fed by a reciprocating feeder to a 42-in. belt conveyor and then into the same hopper in the coal-crushing house as the one to which the coal from the injunction house is supplied. Near the head ends of these two conveyors two "weighometers" are installed. The arrangement of chutes in the crusher house is such that the coal can be fed to the coal crushers or to the open storage.

Report of Committee on Cable Joint Design and Construction

EXPERIENCES of Cleveland, Chicago and Brooklyn with the migration of compound from joints where a thin compound was used partly or entirely, a description of single-conductor joints made for the 75,000-volt, three-phase installations of the Philadelphia Electric Company and the method of filling joints with a pressure gun used by the Public Service Production Company were the main subjects included in the serial report of the underground systems committee on cable joint design and construction.

According to the report, several companies have used thin compounds and oil in the high-tension joints and have found that there is usually a disappearance of the compound from the joint, the compound apparently migrating into the cable. The detailed experience of three companies up to the end of 1925 is given in the accompanying table. In general, the operating temperatures of the cable have not materially affected the migration of the joint filling compound into the cable. The rate of migration is sometimes inconsistent for a given length of cable; that is, on one inspection the amount of oil that has disappeared from the joint into the adjacent length will be less than the average for the line, while on the next inspection the reverse will be the case.

The Philadelphia Electric Company has installed single-conductor cable on two underground lines rated at 75,000 volts, three-phase. Each line is about 20,000 ft. long, the conductors being 750,000 circ.mil and insulated with 30/32 in. of impregnated paper. The design of the cable joint employed is shown in the accompanying illustration. The detailed procedure in making this joint was given in the report, including the preliminary work, square and undercutting, connecting cables, paper-tape insulating, reinforcing the ends, assembling barrier and outer sleeve and filling with oil. The report concluded with a description of the method used by the Public Service Production Company for filling joints under pressure.



JOINT FOR 750,000-CIRC.MIL, SINGLE-CONDUCTOR, 75-KV. CABLE AS MADE BY THE PHILADELPHIA ELECTRIC COMPANY

MIGRATION OF COMPOUND FROM JOINTS FILLED WITH THIN COMPOUND

Cable: Kind	Chicago Three-Conductor, 35-Kv.	Cleveland Single-Conductor, 66-Kv. Standard Conductor	Cleveland Single-Conductor, 66-Kv., Hollow, Center	Brooklyn Three-Conductor 27-Kv.
Joint compound:				
Kind	Oil	Thin grease	Thin grease	Petrolatum
Volume per joint—pints	35	26	2ℓ	20
Viscosity at 50 deg. C.—seconds (Saybolt)	80	138	128	400
Compound added	Yes	Yes	Yes	No
Kind	Same as in joint	Same as in joint	Same as in joint	Transil oil*
Viscosity at 50 deg. C.—seconds (Saybolt)	Same as in joint	Same as in joint	Same as in joint	45*
Maximum migration per joint per day at beginning of operation—pint	0.088	0.02	0.043	0.014†
Length of operation—months	5	18	18	20
Average migration per joint per day during operation—pint	0.04	0.003	0.0055	0.002†

* Oil in siphon reservoir—no oil has been added to reservoirs during operation.
† Indicated by decrease in amount of oil in reservoir.

Accountants Systematize Their Work

Committee Reports Compile Valuable Data on Accounting Methods and Forms—Essential Need for Better Definitions of Industry Terms Indicated—Notable Addresses at Section Meeting

AT THE convention this year the accountants presented a notable list of speakers on many important topics. But they also have printed several fine reports which were not given great prominence at the meeting. These reports deal with definite accounting problems and the one on statistical methods is especially noteworthy and should be considered by all men in the industry.

C. M. BREITINGER
Chairman Accounting Section

Report of General Committee, Accounting National Section

BREVITY characterized the report of the general committee, of which W. B. S. Winans is chairman, on account of the fact that most—in fact, practically all—of the work of the committee had previously been presented in serial reports issued during the past year. However, in this report the committee took occasion to draw attention to several points which were treated more at length in the serial reports, these points having to do with quality of paper and printing, which is the accountant's raw material, and with the necessity for better accounting tools. It was recommended that accounting divisions of all member companies should make use, so far as the volume of work permits, of all office machinery which can reasonably be expected to

W. B. S. WINANS
Chairman Accounting Committee

reduce the necessity for manual labor. Preceding by only a few weeks the report to the national convention was the serial report of this committee relating to the design, printing and handling of forms. The subject was outlined with consideration of the design, the selection of paper and methods of printing on forms for office and general business use. The ultimate considerations in form design were stated to be usefulness, cost, filing space required, routing speed and clerical labor involved, and it was felt that uniform and proper methods of designing forms, selecting paper and specifying printing should reduce printing costs and enhance the usefulness of the product.

Accounts Payable Committee

APPLICATION of assorting and tabulating machines to central-station accounting processes was a principal topic in the report of the accounts payable committee, of which J. A. Bissell is chairman. These machines were first used by the National Census Bureau at Washington for classifying and tabulating census returns and later came into commercial use, principally for the purpose of compiling statistical information. However, they have been found to be equally well suited to the accounting work of central stations. A rather detailed description of the operations of these machines on accounts payable and payrolls was presented by the committee. A part of the report was devoted to the machine methods for the analysis of voucher records of checks which have been issued. This machine separates the vouchers into their proper accounting classifications and furnishes totals that can be directly compared with the totals of the voucher records.

Report of Statistical Methods Committee

WORK of the first year of the statistical methods committee (L. S. Goodman chairman) was summarized in its report. The scope of work assigned to this committee was to study and report upon methods for the arrangement and presentation of statistical data, including graphic presentations to promote the standardization of statistical information and terminology, and to study developments and changes in the filing, preservation and destruction of records. Rather than to work out all parts of this assignment in detail, the committee contented itself with laying the general foundation for future development of the work and to this end presented in its report a tentative general classification of statistics, some suggestions on terminology and a brief consideration of presentation of statistical data. All of the recommendations of the committee on these lines are to be taken as tentative and subject to such criticism and suggestion as may be offered by interested persons.

Statistical data of the electrical industry may be defined as operating history so classified and arranged as to present a picture of the growth of the industry useful as a ground for induction. The general problems presented,

L. S. GOODMAN
Chairman Statistical Methods Committee

therefore, were what data should be maintained, how these data should be standardized for purposes of collection and compilation into national statistics of the industry as a whole, and how individual and collective data should be set up in order to serve useful purposes.

In the classification of statistics the committee set up four main headings—financial, obtained primarily from the accounting organization; physical and operating, obtained from the construc-

tion and operating organization; commercial, from the accounting and commercial organizations, and general, from sources both within and without the company organization. The committee further recognized two principal types of statistics, original statistics and developed statistics. Original statistics comprise the fundamental data directly resulting from operation. Developed statistics are relations between original statistics, these welding the statement into comprehensive form.

In the endeavor to set up a standardized terminology for use in the industry, the committee put forward the following definitions and invited criticism of them:

1. *Generated Output or Net Kilowatt-Hours Generated.*—The kilowatt-hours produced in the station that are available for transmission. This excludes all energy used in the operation of the station. It should be determined from readings of meters on main units less station use therefrom.

2. *Purchased Energy or Kilowatt-Hours Purchased.*—This should include all energy purchased and should be measured at the point of purchase. On interchange contracts gross kilowatt-hours received should be included, energy delivered being treated as kilowatt-hours sold.

3. *Capacity of Generating Stations.*—This term has, by usage, become more or less synonymous with "rating" or "rated output." For general statistical purposes it should be expressed in kilowatts based upon manufacturers' ratings of the main generator units in the station capable of delivering power, unless operating experience has definitely shown these ratings incorrect, in which case proved effective ratings may be used. Auxiliary units for station use, however driven, are excluded.

4. *Maximum Generated Demand.*—The greatest of all the demands on main generating units owned and leased by the utility which have occurred during a given period, expressed in kilowatts and obtained from indicating instruments read simultaneously at appropriate time intervals.

5. *Maximum System Demand.*—The greatest of all the demands on all main generating units and other sources of power which have occurred during a given period, expressed in kilowatts and obtained from indicating instruments on the units and at points of input to the system from other sources read simultaneously at appropriate time intervals.

6. *Generating Station Load Factor.*—The ratio of the average kilowatt demand on main generating units during any period (obtained by dividing the recorded kilowatt-hours delivered from the main units by the hours in the period) to the maximum generated demand.

7. *System Load Factor.*—The ratio of the average kilowatt demand of the system (obtained by dividing the recorded kilowatt-hours delivered from the main units and kilowatt-hours purchased by the hours in the period) to the maximum system demand.

8. *Plant Capacity Factor.*—The ratio of the average kilowatt demand on main generating units to the capacity as previously defined.

9. *Fuel Consumption for Electric Generation.*—Include fuel used for all purposes in the generating stations. Express coal in tons of 2,000 lb., oil in gallons and gas in cubic feet. State kind and calorific value of fuel as fired.

10. *Station Fuel Performance.*—State in B.t.u. per kilowatt-hour of generated output, with kind and calorific value as fired, if not given with (9).

11. *Customers' Meters in Service.*—Include all meters installed on customers' premises whether active or inactive.

12. *Number of Customers.*—This is a term too commonly used to pass without comment, and practice is too diverse to permit acceptable definition. The term is presumably intended to represent the number of locations at which a company supplies light or power service, or both, for which it renders a bill or bills to an individual, firm or corporation. Further study of practices should be made.

13. *Number of Employees in the Electric Utility.*—This number shall be the number of persons, including officials, actively on the company's payroll at any particular time—in contradistinction to the number paid on any pay day. Employees working only short periods or part time for the electric utility should be figured in terms of man equivalents. This particularly applies to cases where a company operates several major utilities, such as electric and gas.

14. *Area of Territory Served.*—This shall include the total area of cities, towns, communities, or other geographic or political subdivisions in which the company distributes electric energy to the individual users. Where the area is not well defined by geographic or political subdivisions, it may be estimated reasonably to include the field in which the company has potential customers.

15. *Population of Territory Served.*—This is the total population resident in the area served. When reported for years other than census years, it should be estimated as of the year in question.

16. *Kilowatt-Hours Sold.*—The kilowatt-hours delivered and billed to customers as obtained from meter readings on customers' premises or as estimated at the points of delivery to the customers in the absence of recording meters. Energy used by the utility in its operations should not be included.

In the matter of the presentation of statistical data the committee felt that the practices of the electrical industry should not depart from generally accepted methods used in other industries. The committee recognized the two principal methods of presentation, tabular and graphic, and devoted considerable time to the study of the physical layout of such presentations so that they might be both effective. The results of these studies are presented in the report.

In regard to the filing, preservation and destruction of records the committee presented no conclusions, since this phase of its work was not developed this first year.

Report of Accounts Receivable Committee

THE accounts receivable committee, of which J. F. Ford is chairman, entered upon its work for the past year with the thought in mind that all suggestions of subjects to be investigated or studied should originate in the geographic divisions rather than in the national committee, as has been the past practice. Quite a number of suggestions for study were received, but since a number of these suggestions were of a specifically local character, the committee felt justified in reducing its labor to consideration of two subjects—(1) the register sheet plan of keeping customers' accounts, and (2) methods employed for recording merchandise on deferred-payment accounts. In addition to these there are a number of subjects on which the committee will issue serial reports from time to time as conclusions are reached. Some of these subjects are as follows: (1) Methods employed by customers' accounts departments for furnishing information to the collection department on delinquent accounts; (2) typical installations of machine billing and bookkeeping systems and types of machines used therewith; (3) simplified customers' accounting plan used by the Detroit Edison Company, in which a copy of the bill is used as a ledger record.

In regard to the register sheet plan there was included in the report a statement by the Minneapolis General Electric Company, which installed this plan for use with residential and small commercial accounts.

In regard to deferred-payment merchandise accounting the committee studied many plans which are in use by various companies and as a result of this study submitted in its report a complete plan for carrying on this class of accounting, which the committee felt combines the merits of many of those now in use.

Report of Purchasing and Storeroom Committee

THE report of the purchasing and storeroom committee (E. S. Brock chairman) of the Accounting National Section was concerned with a discussion of and suggestions for purchasing and the necessity for providing proper storage facilities at strategic points in company systems so that they will be available in emergencies. An outline of the classifications and money invested by accounts for control purposes was presented. Recommendations were made for periodic inventory and retirements through obsolescence or inadequacy of equipment. The committee also studied the elements constituting storeroom expense and the various methods of distributing it and presented a tabulation of all items considered as stores expense by the various companies reporting on the subject as well as a summary of the practices of the different companies in regard to the distribution of stores expense. The report closed with a discussion of a form of report with tables showing the progress of financial control, cost of operation and such other data as will exhibit to executives the operating trend of the stores department. This form of report was discussed with considerable detail and took acount of the fact that fundamentals of management of stores are ultimately concerned only with two matters. These are (1) the activity of the money involved in stock as shown by the stock account balances and the amount of their respective issues; (2) the cost of the work of handling the material in relation to its value as shown by the amount of the stores expense account and the value of the issues over the same period.

Report of Fixed Capital Committee

PROMINENT items in the report of the fixed-capital committee, of which E. S. Haymond is chairman, concerned (1) work-order systems, charges as well as credits or retirements; (2) property records; (3) the relation of these to budgets, estimates, construction ledgers and balance sheet. Work-order systems are in quite general use for keeping track of capital accounts, and the committee felt that in the development of an adequate work-order system it is essential that the information on the various items which make up the capital account should be submitted in such a manner as to insure the recording in the work-order ledger of adequate information. This means that the forms used and the methods followed should be developed with this object in view. In regard to property records it was felt that such records are necessary in large companies where the great amount of property makes difficult the handling of these records as a part of the capital account system. Such records also may develop as continuous inventories. The relation of these to budget work and to general accounts was discussed.

News of the Industry

E. D. Adams Gives $100,000 to Engineering Research

A dinner of the Engineering Foundation, held at the Union League Club, New York City, on Wednesday evening was signalized by the announcement of a gift of $100,000 from Edward Dean Adams to the research endowment fund of the organization. Mr. Adams, whose instrumentality in bringing about the harnessing of Niagara Falls is well known to electrical men, was the guest of honor at the dinner. The announcement was made by W. L. Saunders, president of the United Engineering Society. Mr. Adams' is the third large gift to the research endowment fund, which now totals $650,000. The other two were $500,000 by Ambrose Swasey of Cleveland and $50,000 under the will of Henry R. Towne.

The Engineering Foundation has set $20,000,000 as the goal for this fund, which is to be used in promoting scientific research in engineering in the universities and industries of the United States. Members of the organization voted to allot $30,000 for a three-year program of research in blast-furnace slags at the University of Wisconsin and $10,000 to Johns Hopkins University for two years of research in electrical insulation under the direction of Prof. J. B. Whitehead. Prominent members of the A.I.E.E. attended Wednesday's dinner, at which L. B. Stillwell presided.

Gatineau River Plant Rating Increased to 290,000 Hp.

The Canadian International Paper Company, which originally proposed to install but four units at each of the power plants at Chelsea and Farmers Rapids on the Gatineau River, near Ottawa, has decided to add another unit to each power house, which will increase the maximum capacity of the two plants for power production by 58,000 hp. The power development at Chelsea, as at first planned, was for 136,000 hp. This will be increased to 170,000 hp., while at Farmers Rapids the power development will be 120,000 hp., instead of 96,000 hp.

Apart from the 260,000 hp. which has been sold to the Ontario Hydro-Electric Power Commission and which will be furnished almost entirely by the Paugan Falls development on the same river, the company has allocated 50,000 hp. for use in the Province of Quebec. It will also have in reserve another 50,000 hp. available for industrial use.

There is the possibility of the projection of another power development at Six Portages on the Gatineau River, a considerable distance above the Chelsea plant. From this source 65,000 hp. would be available if developed as a low-unit proposition. The electric installation at the company's Kipawa site is to be increased from 8,000 hp. to 24,000 hp.

President A. R. Graustein of the International Paper Company, who was in Ottawa, Ontario, a few days ago, spoke of the company's power development policy as follows: "It will be the policy of the International Paper Company to keep ahead of the possible demand for electrical energy. By that I mean that we shall not confine our development to suit existing conditions, but will prepare a large reserve power which will be available to meet expanding industry in this district. This will mean for the company an expenditure of a considerable sum of money, for which it cannot expect to receive returns for some years to come, but the power plants will be so constructed that as the units become necessary they can be put into operation."

Arizona Has Its Innings on Boulder Dam

Her Right to Impose a Tax on Water-Power Projects Whose Usufruct Extends to Other States Urged—American Farm Bureau Federation Opposes Muscle Shoals Bill

By PAUL WOOTON
Washington Correspondent ELECTRICAL WORLD

ABANDONING its plan to proceed with immediate consideration of the Swing-Johnson Boulder Dam bill in executive session, the irrigation committee of the House of Representatives on May 17 agreed to reopen hearings for a statement from Dwight B. Heard, editor of the Phoenix (Ariz.) *Republican*, who was a candidate for Governor in 1924 as an advocate of the Colorado River compact. Mr. Heard asserted the rights of Arizona to use of the waters of the Colorado River and to impose a royalty tax on projects in Arizona where the usufruct shall extend to neighboring states. He urged that a tri-state treaty between Arizona, California and Nevada, covering the right of Arizona to impose such a tax, be entered into and agreed to by Congress as preliminary to legislation for development projects, and also maintained that the United States should meet the expense of flood control as its part of the cost of the undertakings.

It is expected that a commission appointed by Governor Hunt of Arizona will appear before the committee next week. In event of the passage of the Swing-Johnson bill Arizona is expected to appeal to the federal courts to protect her interests. Senator Ashurst of that state found opportunity on Monday to proclaim on the floor of the Senate that a grave injustice would be perpetrated were the bill to pass. "To place the dam at Boulder will be to waste one-third of the potential horsepower," he said. "If the dam is placed 90 miles above its proposed location, it will not only generate approximately 50 per cent more horsepower, but the city of Los Angeles can be supplied with more water than it needs by gravity."

Farm Bureau Federation Decries Muscle Shoals Bill

The American Farm Bureau Federation has issued, over the signature of Chester H. Gray, acting director, a statement opposing the bill of the joint congressional committee introduced in support of the bid for the Muscle Shoals properties made by the associated Southern power companies. The federation makes five "major basic objections" and six others. It opposes divided responsibility as between nitrate and power production and complains that there is no definite guarantee to produce any fixed amount of fertilizer, that the process to be used is experimental, that the cost of power will be high because of the high bid, and that the lease has no amortization feature. The companies, it says, are entirely unfamiliar with fertilizer production and their interest lies in power. If they can pay the government more than any other group, that is because the payment will be recouped from their customers. Friends of the pending bill feel that they will have no difficulty in defending it against these criticisms.

No Metric Legislation This Session

Other legislative proposals intended to bring about increased use of the metric system of weights and measures having failed, bills now have been introduced in the Senate and in the House proposing that the Department of Commerce be authorized "to establish commodity quantity units for general use in merchandising after 1935, standardizing the yard to the meter, the quart to the liter and the pound to 500 grams, decimally divided." The legislation was introduced in the Senate by Mr. Gillett of Massachusetts and in the House by Mr. Britten of Illinois. It is stated by the committee on coinage, weights and measures of the House that the committee will give no consideration to the measure at this session. In the Senate the bill was referred to the commerce committee, instead of the manufactures committee, to which such legislation has been referred before. As the commerce committee is one of the busiest of the Senate, it is believed that no time can be found thus late in the session to consider the metric bill.

Progress of Rural Electrification

Conference at Chicago Brings Out the Latest Experiences of National Committee Authorities—Encouraging Outlook Is Described by Those in the Work

PROGRESS up to date in the national study of the relation of electricity to agriculture was well pictured and a glimpse of future prospects was afforded by the addresses and papers presented at the rural electrification conference held in Chicago May 12 and 13 under the auspices of the Agricultural Publishers' Association. "Will electrification make farm life better and farming more profitable?" "How can a farmer get the service?" "What equipment problems will it bring?" These were questions answered by some of the best-informed men in the United States. The replies were drawn from farms, agricultural colleges, state electrification projects, utility companies, electrical and agricultural implement manufacturers and the National Committee on the Relation of Electricity to Agriculture.

Better-lighted buildings, a reduction in the labor attached to household and farm duties and increased opportunity to enjoy home life result from farm electrification, declared Dr. G. I. Christie, director of the agricultural experiment station and department of agriculture extension at Purdue University, Lafayette, Ind., and he gave evidence to substantiate these statements.

Mrs. Harry M. Reifsteck, who lives on an electrified farm in Illinois, demonstrated the value of electricity on the farm by relating her experiences with various appliances, including the range, refrigerator, washing machine, flatiron, vacuum cleaner, table utensils, curling iron and egg candlers.

Discussing the profitableness of farm electrification, Prof. J. B. Davidson, Iowa State College, presented government data showing that 45 to 62 per cent of the total cost of raising wheat, potatoes, corn and cotton is for labor and power and that a greater value of crops is produced per worker with more machinery per worker. His facts indicated that farm profits can be increased by reducing this expense item through the use of more power-operated mechanical equipment judiciously selected and applied. Already, Professor Davidson said, electricity is economically adaptable to all light power requirements—which total 2,000,000,000 hp.-hr. Improvements in mechanical transmission devices are needed, however. The greatest progress will come through reorganization of farm operations to permit more continuous use of smaller units of motive power. Special consideration should be given to the flexibility and automatic control afforded by electricity.

Ralph Arbogast, a Michigan farmer, related personal experiences with electric applications on his farm, showing actual savings made thereby. Farm electrification will solve the problem of farm tenantry, he declared.

Project leaders from Wisconsin, Alabama and Minnesota, states which have been engaged in co-operative study for some time, presented extensive data on experiences, energy consumption, costs, benefits, etc. Their figures indicated that electricity can pay its way.

With the new rural rate obtainable in Wisconsin, a farmer using 100-kw. hr. a month can obtain as good a rate as a person living in a city of 20,000, Prof. F. W. Duffee declared. He also classified applications into (1) those of approved mechanical and economic worth, (2) those of probable practical value, and (3) those mechanically satisfactory if the farmer can afford them. Prof. E. C. Easter pointed out that 88 per cent of the energy consumption on Alabama's many electrified farms is in the farm homes. Dairymen and poultrymen, he has found, admit decided economies from electrification. Prof. E. A. Stewart, in addition to presenting extensive data and experiences from Minnesota, emphasized the need of reliable, adequate service. He advocated revised ideas on farm wiring and an adequate investment in utilization equipment.

MANY ANGLES TO THE WORK

At the banquet Wednesday night Dr. H. C. Taylor, Northwestern University, outlined what can be accomplished by farmers through more orderly production and marketing. Marshall E. Sampsell, president Central Illinois Public Service Company, explained what utility interconnection will ultimately mean to the farmers.

Asserting that agriculture is finding the pre-eminence of American industry to be due to mechanical equipment and electric power and that a large increase in production is possible through the automatic features thereby afforded, Arthur Huntington, Iowa Railway & Light Company, philosophized ably on the solution of agricultural problems.

The new rural service contract afforded by the Wisconsin Power & Light Company was explained by E. R. Meacham, who declared that 2,500 farmers will be connected in the near future. Activities of the rural service department were also explained, while H. O. Prior, Delco Light Company, showed how isolated farm-lighting-set manufacturers are co-operating to serve farmers.

R. F. Pack, first vice-president of the National Electric Light Association, painted a picture at the Thursday luncheon of what utility companies have done to serve urban commercial and industrial customers and declared that they can be expected to fulfill their obligations to the farmer.

Equipment problems were considered by O. B. Zimmerman, International Harvester Company, and F. H. McCormick, Edison Electric Appliance Company. Mr. McCormick indicated the initial cost and operating expense of various electrical appliances for the farm home, concluding that if radio sets and automobiles can be sold to farmers, there should be no financial barrier to electrical devices. Mr. Zimmerman presented government figures indicating how farm machinery has enabled a much smaller percentage of the total population to provide agricultural needs. He also pointed out that stationary power on the farm—17 per cent of the total—can be provided electrically from standard motors with one-quarter, one-third and one-half speed reductions, or belt speeds of 2,000 ft. per minute. "Clutching in and out," reduction of speed fluctuations by increased flywheel effect or higher speeds, reduction in size of units, automatic control and continuous operation are important considerations, he said.

The conference was concluded by Prof. F. D. Paine, assistant director of the National Committee on the Relation of Electricity to Agriculture, who reviewed the high points of the conference, outlined equipment problems and fundamental requirements and illustrated what has been done in poultry raising by means of the ultra-violet light.

E. D. Adams to Speak at Institute Banquet Next Week

Announcement is made by Prof. Harold B. Smith, who will be the toastmaster at the banquet of the regional gathering of the American Institute of Electrical Engineers to be held at Niagara Falls next week, that the chief speaker will be Edward D. Adams, who will talk on the pioneer development of hydro-electric power at the cataract. Mr. Adams will be preceded by seven speakers who will occupy five minutes each, these being Paul A. Schoellkopf, president Niagara Falls Power Company, and President Pupin, former President Osgood, former Vice-president Faccioli, Secretary Hutchinson, Vice-president-elect Hobart and President-elect Chesney of the Institute.

Commission Engineers Discuss Public Utility Problems

Engineering questions confronting the public utility commissions of the country were discussed and definite plans of action on some of them were taken at the fourth conference of engineers of public utility commissions held under the auspices of the Bureau of Standards at Washington on May 13 and 14. The decisions of the conference are offered to utility commissions by this body as the best method in its judgment of coping with prevailing problems.

One question which was given consideration was that of electric rates for cooking. A report on a special committee appointed to investigate this subject was presented by C. B. Hayden of Wisconsin, chairman of the conference. Power-line interference with radio reception, transmission lines along highways and other matters of import to utilities commissions were debated.

Dr. George K. Burgess, Director of the Bureau of Standards, addressed the meeting. The report of the committee on the selection, use and care of secondary electric standards was presented following his remarks. C. R. Vanneman of New York put before the conference a report from the committee on service rules for gas, electric, telephone and water utilities, of which he is chairman.

A.E.C. Still Opposed to River Surveys by Army Men

River surveys as proposed by the Corps of Engineers and by the Federal Power Commission in a report recently made to Congress are, in the opinion of the American Engineering Council, "unnecessary and would constitute an unwise expenditure of public funds." L. W. Wallace, executive secretary of the American Engineering Council, in discussing the matter before the rivers and harbors committee of the House of Representatives, declared that the fundamental data on water supply and topography now being collected by the Geological Survey are sufficiently complete to serve the needs of all interested. He pointed out that a comprehensive program of topographical surveys has been authorized by Congress and that a similar authorization for a water resource inventory is pending.

"If Congress will make regularly the appropriations these regulations contemplate," Mr. Wallace declared, "all the data required for water-power development will be assembled with sufficient rapidity to meet all needs. To collect these data through any other than the accepted agencies now doing the work would result in duplication." The point also was made to the committee "that while official surveys of this character are being made, it has been the practice of the government to prevent the development of the power demanded by the consuming public until the completion of the survey work."

Northwest N.E.L.A. Arranges for Its June Meeting

Both national and regional features will be incorporated in the program of the annual convention of the Northwest Electric Light and Power Association, to be held at the Davenport Hotel, Spokane, on June 14 to 17. Among the prominent speakers expected are James E. Davidson, R. F. Pack, M. H. Aylesworth and Isabell Davie of the N.E.L.A.; Earl W. Hodges of New York, D. L. Huntington, J. B. Fisken, W. H. Ude, Franklin T. Griffith, P. M. Parry and L. A. McArthur of the Northwest Section. Three days will be given to general sessions for business and the last day largely to entertainment. The annual golf tournament will take place Thursday at the Hayden Lake course, to which the convention will adjoin. Other entertainment features are the president's reception Monday evening, a dancing and swimming party Tuesday evening and a dinner dance Wednesday evening.

First Contract Let for New Idaho Development

Letting of a contract for a power dam and power house on the Clearwater River, near Lewiston, Idaho, presages early commencement of the joint power and sawmill development at Lewiston in which the Clearwater Timber Company and the Inland Power & Light Company are associated. The mill will be able to cut 200,000,000 ft. annually, and the generating plant will develop 10,000 kw. The dam is to be 35 ft. high and about 1,000 ft. long. An earth-fill dike extending about 7,000 ft. parallel to the river will sustain the diverted water in a forebay covering 400 acres.

The power house will be built in the dike at the west end of the forebay. Short steel penstocks will carry the water through two 7,000-hp. S. Morgan Smith waterwheels direct-connected to 5,000-kw. Allis-Chalmers generators. A tailrace 4,500 ft. in length will carry the water back into the Clearwater River. The sawmill will be situated below the forebay on property adjacent to the power house. An outdoor transforming and switching station will provide the terminus for a 66,000-volt tie line to the Clarkston (Wash.) substation of the Pacific Power & Light Company, 3 miles distant, from which the Lewiston district is served. This will tie the new plant in with the Yakima-Walla Walla (Wash.) power system of that company, furnishing a new source of supply on the extreme eastern end of that system. The new power house will be about one mile east of the city limits of Lewiston and the dam is to be 3 miles from the confluence of the Clearwater with the Snake River.

Niagara Development a National Affair

Federal Power Commission Asserts Concurrent Jurisdiction with New York—Action by United States Board Mandatory, It Says, in Reply to State

DISSENT from the contentions of Charles E. Hughes to the effect that New York State has primary authority over water power on the Lower Niagara River and assertion that Congress has made the approval of the Federal Power Commission a prerequisite to further development on that stream are contained in a letter written to Mr. Hughes on May 15 and signed by O. C. Merrill as executive secretary of the national body concerned. Mr. Hughes, in the capacity of special counsel for the State of New York, had championed the unconditional validity of a preliminary permit granted by the New York Water Power Commission to the Lower Niagara River Power & Water Supply Company for a hydroelectric development and had disputed the right of the Federal Power Commission to make the project subject to the 50-year recapture clause of the water-power act passed by Congress in setting up the national commission. (See ELECTRICAL WORLD for March 6, page 521.)

In maintaining that the exercise of authority by the Federal Power Commission was mandatory under the act of Congress, which alone has the ultimate authority to consent to the erection of structures in the river and cannot be compelled to grant or withhold its consent; that, the Niagara being an international stream, such structures are also subject to the approval of the International Joint Commission, and that all questions of constitutionality must be left to the courts, Mr. Merrill made these among other observations:

"Whether a change in the natural level or flow of boundary waters on the other side of the line would or would not cause material damage, or any damage, appears unimportant from the standpoint of jurisdiction. The determination of the extent of damage, if any, is not within the competency of either country acting alone. That matter is left to the agency created by the treaty—the International Joint Commission. On the other hand, the approval of the international commission by itself is not sufficient. The obstruction or diversion, if within the United States, cannot be made 'except by authority of the United States.' . . .

"The state and the federal governments having concurrent jurisdiction, it is within the power of either, should it so wish, to interpose its veto on the construction of the project. It must be assumed, however, until evidence to the contrary appears, that both agencies in the exercise of their powers have only the public interest in view and need, therefore, find no difficulty in reaching joint conclusions upon the several matters named above. . . .

"With respect to the provisions of the license and of the law concerning recapture, it is the opinion of the commission that the provisions . . . are not, and were not intended to be, of themselves, a grant of authority to acquire such properties for the United States. It seems elementary that the United States may acquire private property only for a public use and that what constitutes a public use must be interpreted in the light of the constitutional powers of Congress as possessed at the time the property is to be taken. Unless during the next 50 years Congress shall be given, through amendment of the Constitution, authority to acquire property for purposes not now authorized, its right of recapture when a license expires will be limited to the same purposes for which such right might now be constitutionally exercised, namely, for governmental purposes. Furthermore, in order to make exercise of the right effective, an appropriation of moneys must be made and such appropriation, since it requires action by Congress, will likewise require the approval by Congress of the proposal to acquire at the time when the acquisition is proposed to be made. In case, therefore, of recapture for a constitutional purpose under the terms of the federal water-power act of properties licensed under that act, the only real relation to the transaction of the provisions of that act would appear to be in determining the price to be paid for the properties."

Electric Power Club Program in Final Shape

As finally adopted, the program for the meeting of the Electric Power Club at Hot Springs, Va., May 24 to 27, will embrace two evening sessions, on Monday and Tuesday; the annual banquet, on Wednesday evening, and

a morning session on Thursday. On Monday evening President Alfred E. Waller will discuss "The Price of Progress" and N. A. Wolcott "Business Policies." On Tuesday, Secretary S. N. Clarkson will tell of "Some Things Accomplished," and Clarence L. Collens will talk about the Electrical Manufacturers' Council. L. A. Osborne's topic at the banquet on the following evening will be "How Can Our Industry Be Made More Effective?" A discussion of the proposed National Electrical Manufacturers' Association will be the main feature of Thursday's business session. Officers' and committee reports will, of course, be presented as usual.

Dexter P. Cooper Gets Preliminary Permit

Can Now Negotiate with Canadian Authorities Concerning His Tidal-Power Project on Passamaquoddy Bay—Federal Commission Grants Other Applications

ISSUANCE of a preliminary permit to Dexter P. Cooper, Inc., of Eastport, Me., covering the proposed development of tidal power in Passamaquoddy and Cobscook Bays, in Washington County, Maine, has been authorized by the Federal Power Commission. The proposed development will affect, in addition, the St. Croix River and lands and waters in the Province of New Brunswick. It is proposed to construct dams between various islands and between islands and the mainland so as to divide the waters of the two bays into two pools. It is intended that water will flow from the ocean through 43 gates into the upper pool and pass to the lower pool through the power house. The lower pool will be emptied into the ocean through 30 gates when the tide is falling.

Mr. Cooper expects to obtain a mean operating head of 13 ft. between the pools and with a flow of 300,000 sec.-ft. expects to develop 2,500,000,000 kw.-hr. annually, with an installed capacity of 600,000 hp. Boston is to be the principal market for the power. Navigation is to be provided for between the upper pool and the ocean by one large lock and one small lock and between the ocean and the lower pool by one small lock. The Chief of Engineers has stipulated conditions which will safeguard the interests of navigation. With this permit Mr. Cooper now will be in a position to take up the matter of obtaining Canadian approval of the project. A bill incorporating the Canadian Dexter P. Cooper Company has already been introduced in the Dominion Parliament.

The commission has authorized a license for the Northwestern Power & Light Company, which serves Port Angeles and other places in the State of Washington, covering a development on the Elwha River in Clallam County, Wash. The plans call for a concrete arch dam 195 ft. in height, a tunnel 530 ft. long and the installation of 12,000 kw. Power is to be fed into the company's existing system. The reservoir will provide 20,000 acre-ft. storage.

A license for the Inland Power & Light Company of Portland, Ore., has also been authorized. It covers the project on Clearwater River near Lewiston, Idaho. The installation is to be of 10,880 hp.

A license has been issued to the Livingston Mines Corporation in pursuance to rights acquired by the late J. E. Walker. The project is on Big Boulder Creek in Custer County, Idaho.

The license of the Rock Creek Power Company of Missoula, Mont., has been amended so as to extend the period for the completion of construction work to Aug. 1, 1928.

A preliminary permit has been authorized for the Missouri Hydro-Electric Power Company of Kansas City covering a project on Current River. The project involves the construction of an 84-ft. dam at Hargus Eddy and a 194-ft. dam at Mill Creek, 5 miles above Van Buren. The primary power available is 21,000 hp.

A preliminary permit has been authorized for Giffen, Porter, Pearsall, Freeman & Knapp of Los Angeles. The project involved is on the North Fork of the Trinity River and the East Fork of that stream. The power is intended for use in mining operations. A similar permit was authorized for Knight, Kay, Stone, Hall, Breeded & Wilson of Eureka, Cal., covering a project on New River in Trinity County.

A permit has been authorized also for the West Coast Iron & Steel Company of New York, covering a project near the head of Copper Harbor, Alaska. Storage in Mellen, Summit and Josephine Lakes is involved.

The Portland (Ore.) Electric Power Company, has applied to the commission for an amendment to its license which will allow it to take up the second stage of its development on the main fork of the Clackamas River in Clackamas County, Ore. A tunnel 22,000 ft. long will carry the water into the Oak Grove reservoir. An additional 37,500-kw. unit is to be installed in the Oak Grove power house.

The Federal Power Company of Knoxville, Tenn., has applied for a preliminary permit covering a development on the Toe River and tributaries. The Toe and Cave River reservoirs provide 120,000 acre-ft. of storage.

Municipal Versus Private Service in Oswego, N. Y.

Two views of the proper disposition to make of the water-power site owned by the city of Oswego, N. Y., at Dam 6 on the Barge Canal are still debated by the citizens of that place. On the one hand is the municipal Water Power Commission. This body has been advocating the leasing of the city's power, which totals about 7,500 hp. Against the leasing proposition is the Power Development Association, made up of those who believe that the city should own and develop its own power, reserving a sufficient amount for lighting the streets and public buildings and marketing the remainder. Many are of the opinion that the city is in no financial condition to do this, and a recent vote at a special election resulted in an overwhelming majority for the leasing proposal. But, despite this outcome, the forces opposed to leasing are still actively engaged in fostering sentiment in favor of municipal development. The president of the City Water Power Commission announces that bids for the leasing of the power will soon be advertised for and that the most advantageous offers will be submitted to the vote of the taxpayers at another special election.

The purchase of the People's Gas & Electric, the local electric light and power company, by the Oswego River Power Corporation, a Carlisle subsidiary, has made no change in the situation, for proponents of municipal service regard it simply as a change of ownership from one corporation to another. However, the antagonism which sprang up when the former owners, Charles H. Tenney & Company of Boston, opposed the development by the city of its power site has died down.

Growth of Mississippi's High-Tension Systems

Fourteen years ago, according to E. J. Lenz, district manager at Greenville, Miss., of the Mississippi Power & Light Company, speaking at a business gathering in that city, a map issued by the ELECTRICAL WORLD showed that in the four states of Mississippi, Arkansas, Louisiana and Tennessee there was only one transmission line rated as high as 10,000 volts—a line extending from Greenville to Lake Village, Ark., a distance of about 20 miles. Contrasting this with the system of the Couch companies finished or now under construction, Mr. Lenz said:

"At present there are in operation the Sterlington-Jackson transmission lines, which cross the Mississippi River at Vicksburg and also serve Vicksburg. From Sterlington, La., to the water powers of Arkansas there is a large interconnected transmission system. This line will be tapped at Crossett, Ark., between Sterlington and the Remmel Dam, going due east, crossing the Mississippi River at Greenville, and from there the line is under construction from Greenville to Indianaola, thence north to Cleveland. The same line will ultimately be projected into Memphis and east into Muscle Shoals, and the line from Jackson will be projected north and tied to the line which is now under construction from Greenville east. At intervals this 110,000-volt trunk line system will be tapped at substations. From these substations radiating out from every direction will be 13,200-volt interconnecting lines."

The Southeastern Power & Light Company reports the completion of its 110,000-volt transmission line from Lock 18 in Alabama to Hattiesburg, Miss., and this line has been placed in operation. Construction work is rapidly progressing on the 110,000-volt transmission line toward Pensacola, Fla., and Mobile, Ala. Construction work is also in progress on the 44,000-volt line interconnecting the Mississippi Gulf Coast system with Mobile, Ala.

Purchases and Mergers

Changes in Control Reported This Week Unimportant—Predicted Canadian Consolidation Goes Through

THE Engineers' Public Service Company, a Stone & Webster organization, has acquired control of the Baton Rouge Electric Company in Louisiana. The latter company has been under the management of Stone & Webster, Inc., for some time. It does the entire electric light, electric railway, power and gas business in Baton Rouge and had total assets of $2,687,521 at the close of 1924.

The Great Western Power Company of California has been authorized by the Railroad Commission to acquire all the outstanding stock of the Napa Valley Electric Company and to pay therefor not exceeding $100,000.

The Puget Sound Power & Light Company has purchased the Lake Rutledge Electric Light Company, serving the Long Lake and Hicks Lake districts near Olympia, Wash.

The Adirondack Light & Power Corporation has taken over the management of the Central New York Power Company of Canastota, N. Y., which has been a subsidiary of the Utica Gas & Electric Company. All these companies are in the Mohawk-Hudson Corporation group.

Black Brothers of Beatrice, Neb., have separated their light and power service from their milling activities and transferred it to the newly organized Gage County Electric Company, with $500,000 capital.

The Carey Electric Light & Power Company of Wisconsin and the Carey Electric Light & Milling Company of Illinois, which have been supplying power and light service to communities along the Wisconsin-Illinois border, have both been purchased by George H. Knutsen, Chicago.

The Canada Northern Power Corporation through its representatives, Nesbitt, Thomson & Company, has, as predicted, secured control of the Northern Ontario Light & Power Company, 60 per cent of the stock having been deposited in accordance with the proposed agreement. The Northern Ontario Light & Power Company supplies power to Cobalt, Kirkland Lake, South Lorrain, Boston Creek and other mining camps. The Canada Northern also controls the Northern Canada Power Company, which supplies power to Hollinger, McIntyre and Dome and is building power lines into the Rouyn district in Quebec.

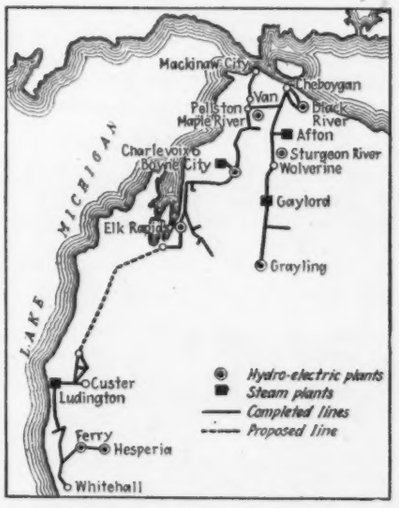
Northern Canada Power's Four Hydro-Electric Plants

In view of the important part the Northern Canada Power Company has taken in developing the North mineral country and the larger part it is destined to play in the future because of the big developments now taking place in Quebec, it is of interest to note that this company was organized in 1911 for the purpose of supplying power to the gold mines of northern Ontario. In its own right, or by the ownership of all the stock of subsidiaries, it controls four hydro-electric power sites having an ultimate capacity of 90,000 hp. These have an installed capacity of 50,000 hp. Three of these are situated on the Mattagami River, in Ontario, and the fourth on the Quinze River, in Quebec. It is from this plant that the Rouyn and other Quebec mining districts will be served when the transmission line now being built is completed. The Quinze plant has an installed capacity of 20,000 hp., which can be increased to 60,000 hp. at a comparatively low cost.

The Northern Canada company also owns 240 miles of high-tension transmission lines, not inclusive of the new line being built this summer. It is the opinion of engineers that northern Quebec will make a demand for power which will absorb the present surplus and necessitate the installation of additional units in the Quinze plant in the near future.

Electrical Expansion Goes on in Northwest Michigan

COMPLETION not long ago of 33,000-volt, three-phase transmission lines connecting four of the A. E. Fitkin properties in northwest Michigan—the Michigan Public Service Company, with headquarters at Cheboygan; its subsidiaries, the Elk Electric Company and the Grayling Electric Company, and the Boyne City Electric Company—has carried the benefits of interconnection to the territory adjoining the Strait of Mackinac. Since this work was finished the power stations at Elk Rapids, Boyne City, Pellston, Black River (near Cheboygan), Afton, Wolverine, Gaylord and Grayling have all been operated in parallel. The new lines are those from Gaylord to Grayling (20 miles) and from Pellston to Elk Rapids (79 miles). It is now planned to extend the line from Elk Rapids south to Ludington, which is already connected with Whitehall, as shown on the map. The Michigan United Light & Power Company at Ludington and the White River Power & Light Company at Whitehall are Fitkin properties. A large reserve steam plant at a strategic point is included in the company's plans.



FITKIN MICHIGAN TRANSMISSION SYSTEM

Governor Smith Permits Delay in Railroad Electrification

Contrary to expectation, Governor Smith of New York approved this week a bill authorizing the Public Service Commission to extend to a date not later than Jan. 1, 1931, the time in which railroads must electrify their tracks in New York City in cases where the commission shall hold the delay to be justifiable.

In approving the bill Governor Smith said that the task imposed upon the railroads is a difficult one because it involves not only the question of electrification but also that of grade-crossing removal. The Governor declared that the Merchants' Association of New York City had certified to him, after an investigation, that nearly all the railroads have arranged for compliance with the law. In three instances the association certified that compliance was physically impossible, and in one case economic questions made compliance seem undesirable.

"The bill was originally aimed at the New York Central Railroad because of the damage to property adjacent to Riverside Drive due to soft coal smoke from locomotives," said the Governor. "As far as the New York Central Railroad is concerned, the survey made indicates that work is now under way to conform with the law on the main line of the Putnam division; also on the Yonkers branch, where they contemplate the operation of oil-electric engines; also at the Mount Marion-Yonkers freight yards, where work is under way to conform to the same order. The places mentioned that are outside the city of New York were added by a subsequent amendment to the original act. They have also submitted plans for electrification between Spuyten Duyvil Creek and the Sixtieth Street yard involving the elimination of grade crossings, which plans were approved by the Public Service Commission in its order of Nov. 12, 1925, on which date the Public Service Commission also ordered the operation of oil-electric engines from the Sixtieth Street yard south. The survey also shows the progress made by other railroads operating in the city of New York."

Governor Smith has also approved a bill amending the penal law in relation to interference with gas, electric or water meters or steam valves by providing that a condition showing such interference exists shall be deemed presumptive evidence of fraud by the consumer.

Fatal Accident at Atlantic City to Wife of Delegate

Convention proceedings at Atlantic City on Tuesday were marred by a fatal accident to Mrs. Fannie L. Denman of Davenport, Iowa, wife of B. J. Denman, who, as vice-president and general manager of the United Light & Power Company and also because of his standing as an engineer, is well known in the light and power industry. Mrs. Denman was riding on the beach with her husband when she fell to the sands from the back of her horse, breaking her neck and dying almost instantly. The body was taken to Davenport.

Agricultural Engineers to Deal with Rural Electricity

Several papers dealing with rural electrification will be presented at the annual meeting of the American Society of Agricultural Engineers to be held at Tavern, Lake Tahoe, Cal., June 23-26. These include "Rural Electrification from an Economic and Engineering Standpoint," by L. S. Wing, engineer for the California Farm Bureau Federation; "The Farmer as a Manufacturer," by Arthur Huntington of the Iowa Railway & Light Company, and "The Relation of Power to Agricultural Production and Profits," by C. D. Kinsman, United States Department of Agriculture.

A special rural electric program has been arranged for the evening of June 23. This will include papers on "Rural Line Characteristics" and "Improving Load and Diversity Factors," by Franklin J. Zink of the Iowa committee for electrical development and F. D. Paine of the National Committee on the Relation of Electricity to Agriculture; "Poultry Conditions on the Farm as Affected by Electricity," by E. A. Stewart, University of Minnesota; "Recent Developments in Electric Brooders," by G. W. Gamble, Oregon Agricultural College, and "Results of Investigations in the Application of Electricity to the Dairy Industry in California," by B. D. Moses, University of California.

Briefer News

Reading, Mass., Ratifies Contract with Boston Edison.—The town of Reading, Mass., has voted to ratify the action of the Municipal Light Board in contracting with the Edison Electric Illuminating Company of Boston for the purchase of electricity in bulk. The vote was 285 to 196.

Officers of Southwestern Public Service Association.—Officers of the Southwestern Public Service Association were elected at the Galveston convention last month as follows: President, Harold E. Borton, Mineral Wells, Tex.; vice-president and chairman Electric Section, E. H. Kifer, San Antonio; secretary (re-elected), E. N. Willis, Dallas.

Montefiore Foundation Announces 1926 Competition. — Announcement of the 1926 contest for the triennial prize of the Fondation George Montefiore, instituted by the late founder of the Institut Electrotechnique Montefiore at Liége, Belgium, is officially made. This prize, which will amount to 20,500 francs, is awarded, following an international competition, to the best original work submitted upon scientific advancement and progress in technical applications of electricity in every domain, popular treatises and mere compilations being excluded. Treatises may be in French or in English and either printed or typewritten. The jury is composed of ten electrical engineers, five Belgians and five of other nationalities, under the presidency of the director of the Montefiore Institute. Treatises may be submitted up to April 30, 1927. L. Calmeau, Rue Saint-Gilles, 31, Liége, is secretary-general of the foundation.

Appalachian Power Company Seeks Danville (Va.) Plant.—A formal proposal from the Appalachian Power Company for the right to enter Danville, Va., and to acquire the municipal franchise and power plant is expected to be made soon to the City Council. A referendum to the voters is talked of. The price rumored as that which the company would be willing to pay is between $2,500,000 and $3,000,000.

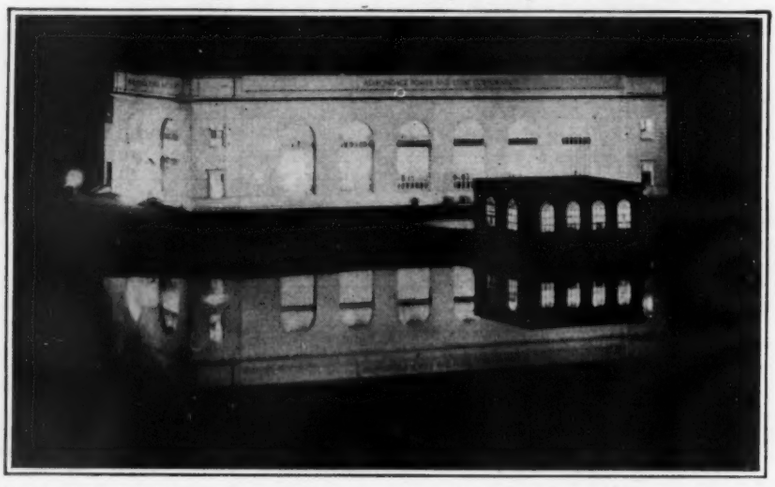
Tacoma's New Municipal Plant Finished.—The Lake Cushman hydroelectric development of the city of Tacoma, Wash., is complete, J. L. Stannard, chief engineer, announces. The second generator at the dam in Mason County has been put in operation. Each generator has a normal rating of 25,000 hp. and an overload rating of 27,500. hp. The city plans a celebration in the near future over the completion of the project, on which it has expended $5,250,000.

Princeton to Build New Engineering School.—Dean Arthur M. Green, Jr., of the Engineering School at Princeton University, has announced plans for a proposed half-million-dollar engineering building. The Princeton Engineering Alumni Association is raising an additional $350,000 to equip the building. The new building will be of stone, three stories high, with a basement for service rooms, and will provide 70,000 sq.ft. of floor space. It will house the mechanical engineering laboratory, the electrical laboratory, the hydraulic laboratory and the machine shop.

Lincoln Turns Down Offer of Standby Service for Municipal Plant.—The city of Lincoln, Neb., has authorized the purchase of $50,000 worth of standby equipment for its lighting plant, including a 2,000-kw. Allis-Chalmers turbo-generator. The city refused an offer of the Lincoln Public Service Company to provide physical connection with its plant, with freedom to draw on its supply of energy, the municipal authorities thus ignoring the opportunity to get standby service for $3,000 a year, or interest on the investment made, without depreciation expense.

California Cities Link Domestic Water Supply with Power Projects.—At the request of the Oakland (Cal.) Chamber of Commerce, Lester S. Ready, chief engineer of the California Railroad Commission, has reported on the relative merits of two proposed schemes for developing a domestic water supply for the cities lying on the east side of San Francisco Bay, both involving the generation of power and calling for diversion of water from the Mokelumne River. The report shows that while the so-called Upper Mokelumne project is capable of an initial development of 86,000 kw. in 1946, the Lancha Plana proj-

Floodlighting of Amsterdam (N. Y.) Power House



THE main building of the steam station of the Adirondack Power & Light Corporation, 3 miles east of Amsterdam, N. Y., is floodlighted, and as a result the station is well known to all who travel over the main state highway or New York Central Railroad at night. The structure was designed by McKim, Mead & White and, located as it is in the foothills of the Adirondacks and in the Mohawk Valley, it has a scenic background. The structure is now as attractive at night as it is in the daytime.

The main plant building and the crib house, of white cement mixed with marble chips, are on the south bank of the Mohawk River; the highway and railroad are along the opposite bank. The station is designed for an ultimate capacity of 300,000 kw. and has an installed capacity of 60,000 kw. The reflection of the floodlighted station in the quiet water is very clear. The illumination was designed by engineers of the General Electric illuminating laboratory, with a lighting load of 26 kw. The north side, which directly faces the railroad and highway, is lighted by a bank of twelve General Electric "L-15" floodlighting projectors with 1,000-watt lamps. The east side is lighted by a bank of ten projectors of the same type mounted on a low supporting structure. The west side is lighted by a bank of eight General Electric "L-3" projectors equipped with 500-watt lamps and stippled glass lenses. They are mounted on the ash-handling structure.

ect has the advantage of lending itself more readily to full development of the resources of the river. The Lancha Plana project includes as part of its first unit a 7,000-kw. plant which would furnish power for pumping. The upper project would cost ultimately $40,000,000 or more in excess of the Lancha Plana project and would not reduce the cost of water.

Another Wynooche Report.—In his report to the Aberdeen (Wash.) City Council on the Wynooche power project which the city proposes to develop (see ELECTRICAL WORLD for May 8, page 1026), W. J. Roberts says that $2,000,000 will develop between 12,000 hp. and 15,000 hp. He asserts that the Weatherwax storage basin, at an elevation of 700 ft., has storage capacity of 200,000 acre-feet. To effect this storage a dam approximately 240 ft. in height would be required. The City Council may call a special election on June 29 to submit the question of the bond issue.

Shedding Light on the Rockies.—A shaft of light from a 7,500,000-beam-candlepower, 900-watt aviation-type beacon will soon be piercing the darkness of night in the Rocky Mountains. A 24-in. General Electric searchlamp, rotating six times a minute, will be installed on top of the Summit House on the Broadmoor-Cheyenne mountain highway. It will play over Colorado Springs and the surrounding country. The beam will supplement the lights which have already blazed a colorful trail along the route of the new transmission line on the mountain.

California Water-Power Map 600 Ft. in Length.—A relief map 600 ft. long, showing watersheds, hydro-electric plants and transmission lines in California, has recently been completed by the California Development Association at a cost of $100,000 and put on exhibition in San Francisco. On the giant map appear the rivers, valleys and cities of the state. Miniature water-power plants, transmission towers and power lines of real wire show the chief generating stations and distribution systems of the electric utilities, and the interconnecting cables and branch lines which supply small communities are also indicated.

Stone & Webster's Virginia Convention.—Executive heads of public utility properties managed by Stone & Webster from all parts of the United States, including the Pacific Coast, and from the West Indies and Canada gathered in Norfolk and Richmond, Va., last week for the managers' meeting held annually by the Stone & Webster organization. Approximately 200 attended the meeting, including members of the firm from Boston, New York and Chicago. The business sessions opened on Monday morning in Norfolk and continued there until Friday, when the gathering was transferred to Richmond by bus for Friday afternoon and Saturday. In going to Virginia the Stone & Webster managers departed for the first time from their custom of holding their annual meeting in Boston, the company's headquarters. The management of public utilities was the chief topic of the business meetings. Entertainment included dinners, a reception at the Ghent Country Club, a golf tournament, a sail to Hampton Roads, an inspection of the naval base and a tour of Richmond.

Nearly Half Missouri's Municipal Plants Have Quit in Last Four Years.—Thirty-eight Missouri municipalities have discontinued publicly owned plants in the state since 1922, the Missouri Committee on Public Utility Information announces, 41 cities still maintaining municipal plants, 14 buying energy from private sources and three purchasing power and light from other municipal plants. Mount Vernon has now voted to relinquish its plant, purchasing power from the Ozark Power & Water Company. In the four-year period covered 22 municipalities have disposed of their plants in entirety for private operation.

Expansion of Baltimore Central-Station System.—Although until the present year the Consolidated Gas, Electric Light & Power Company of Baltimore confined its operations mainly to a district within 3 miles of the city line, it has this year completed a 66,000-volt transmission line from Edgewood Arsenal across Baltimore County to Finksburg, a radius of about 20 miles from the City Hall. This east and west line, J. C. Tuttle of the company's industrial power department points out, is fed from the Philadelphia Road substation in Highlandtown over the Pennsylvania Water & Power Company's right-of-way. In addition the company has completed a 13,200-volt line along Philadelphia Road extending from Baltimore County to a point near Aberdeen. Acquisition of the Bel Air Electric Company has, moreover, resulted in a transmission and distribution system extending from a point near Aberdeen on the east to within a few miles of Westminister on the west, traversing the district lying between Baltimore and the Pennsylvania state line.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, Jan. 2, page 80.]

Electric Power Club—The Homestead, Hot Springs, Va., May 24-27. S. N. Clarkson, Keith Bldg., Cleveland.

American Institute of Electrical Engineers—Regional meeting, Niagara Falls, N. Y., May 26-28; annual convention, White Sulphur Springs, W. Va., June 21-25. F. L. Hutchinson, 33 West 39th St., New York.

American Association of Engineers—Philadelphia, June 1-6. M. E. McIver, 63 East Adams St., Chicago.

Electrical Supply Jobbers' Association—The Homestead, Hot Springs, Va., June 2-4. F. Overbagh, 411 South Clinton St., Chicago.

Association of Iron and Steel Electrical Engineers—Hotel Sherman, Chicago, June 7-10. John F. Kelly, Empire Bldg., Pittsburgh, Pa.

Associated Manufacturers of Electrical Supplies — The Homestead, Hot Springs, Va., June 7-11. F. Nicholas, 30 East 42d St., New York.

North Central Division, N.E.L.A.—St. Paul Hotel, St. Paul, June 8-10. J. W. Lapham, 351 Loeb Arcade, Minneapolis.

Pacific Coast Division, N.E.L.A.—Biltmore Hotel, Los Angeles, June 8-11. S. H. Taylor, 447 Sutter St., San Francisco.

Northwest Division, N.E.L.A. — Spokane, Wash., June 14-17. L. A. Lewis, Washington Water Power Co., Spokane.

Society for the Promotion of Engineering Education — Iowa City, Iowa, June 16-18. F. L. Bishop, University of Pittsburgh, Pittsburgh.

American Society for Testing Materials — Chalfonte-Haddon Hall, Atlantic City, June 21-25. C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Michigan Electric Light Association—Mackinaw Island, June 24-26. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

New York N. E. L. A. Men Have Annual Safety Rally.—Twelve hundred employees, mostly superintendents, foremen and keymen of the various electric light companies of New York City, attended the third annual safety rally of the accident prevention committee of the Metropolitan New York Section of the National Electric Light Association on the evening of May 7 at the Engineering Societies Building, New York City. After an address by Charles B. Scott, president of the National Safety Council, the Insull medal was presented to Charles F. Geissler, an employee of the United Electric Light & Power Company, by Frank W. Smith, vice-president of the company.

Wisconsin Utilities Association Calls Attention to Misleading Textbooks.—Pointing out that approximately 20 textbooks approved for use in the high schools of Wisconsin contain gross misrepresentations concerning the regulation, operation and management of public utility companies, the Wisconsin Utilities Association's committee on co-operation with educational institutions appeals for an effort to bring about their revision. Most of these schoolbooks, the committee says, lean toward public ownership. It holds that the books are largely responsible for public antagonism to utility companies.

Terre Haute, Indianapolis & Eastern No Longer Wishes to Serve Indianapolis Consumers.—The Terre Haute, Indianapolis & Eastern Traction Company of Indianapolis has asked the Indiana Public Service Commission for permission to surrender that part of a permit it received in 1923 which allows it to supply electric light and power in Indianapolis to consumers other than interurban and city car lines. By the petition the company is seen to ask the commission to rule that public convenience and necessity for the operation of a third competitive general electric utility in Indianapolis no longer exists. The move has particular significance because since the permit was granted the Insull interests have acquired ownership of one of the principal Indianapolis utilities, the Merchants' Heat & Light Company, and have outlined a plan to take over the Terre Haute company. When the commission gave the latter permission to enter the Indianapolis power field, the Merchants' Heat & Light Company and the Indianapolis Light & Heat Company made an unsuccessful effort in Marion County courts to enjoin the enforcement of the decree. On losing, the two companies appealed to the Indiana Supreme Court, where their appeal now is on file.

Men of the Industry

O. J. Shaw Made Vice-President of Nebraska Utility

O. J. Shaw, since 1919 secretary and general manager of the Lincoln (Neb.) Traction Company, has been appointed vice-president and general manager of the Lincoln Public Service Company, the subsidiary of the United Light & Power Company recently organized to take over and consolidate the Lincoln Traction Company and the Lincoln Gas & Electric Light Company. Mr. Shaw is a native of Nebraska and a graduate of the University of Nebraska. His first affiliation in the electrical industry was with the Aurora (Neb.) Electric Company and later, when a franchise was secured in Harvard, he was put in charge of building the plant and distribution system of the Harvard Electric Company.

In 1910 Mr. Shaw entered the employ of the Lincoln Traction Company in charge of the electric lighting department. He became assistant secretary in 1911 and in 1913 was given supervision of the overhead distribution system, power-plant operation, steam-heating system, office and accounting of the company. Later he was elected secretary and in 1919 became secretary and general manager.

W. H. Munro has recently been appointed manager of the Nova Scotia Tramways & Power Company, Ltd., Halifax.

L. S. Reagan has been appointed chief engineer and assistant to the general manager of the Southwestern Light & Power Company in charge of engineering and operation.

E. E. Elzemeyer has been elected president of the American Pulverizer Company, St. Louis, to succeed his father, the late Ernest H. Elzemeyer, and Henry Griesedieck, formerly secretary, has been elected vice-president and treasurer.

Mrs. Florence A. Tate, investment manager of the Interstate Public Service Company since Jan. 1 and formerly investment manager of the Kentucky Utilities Company, has been appointed secretary of the Central & South West Utilities Company at San Antonio, Tex. All these companies are subsidiaries of the Middle West Utilities Company.

Harry C. Wilder, for several years president of the Malone (N. Y.) Light & Power Company, has been appointed director of sales of the Northeastern Power Corporation, a Carlisle utility, with headquarters in Rome, N. Y. Mr. Wilder in his new position will be head of a department which will have charge of the sales and extension work of the Carlisle interests in Rome, Watertown, Oswego, Malone and other places.

E. Holgers has become a member of the firm of B. Eichwald & Company, electrical engineers and contractors, New York City. The firm intends to specialize in industrial electrical installations requiring high-grade engineering ability to develop efficient and economical layouts. Mr. Holgers has for the past six years been connected with Dwight P. Robinson & Company, New York, as supervising engineer in charge of industrial electrical work and was for the ten years previous with Westinghouse, Church, Kerr & Company as assistant engineer and engineer in charge of electrical work.

W. P. Little Vice-President of Niagara Falls Company

W. Paxton Little, since 1905 treasurer of the Niagara Falls (N. Y.) Power Company, has been chosen a vice-president and treasurer of that utility. Mr. Little affiliated himself with the Cataract Construction Company as auditor in 1893, when that company was constructing the works of the Niagara Falls Power Company. At the same time he had charge of the account of

W. P. LITTLE

the Niagara Falls Company, and two years later he became assistant treasurer of the latter. His election to the position of treasurer followed in 1905, in which year he also was appointed treasurer of the Canadian Niagara Power Company, Niagara Falls, Ont. He has been serving as chief accounting officer of these companies since that date.

Mr. Little has been prominently identified with the accounting phase of association work in Canadian as well as American organizations, having served as chairman of the Accounting National Section of the National Electric Light Association and as chairman of the Accounting Section of the Canadian Electrical Association.

Capt. William J. Marlowe, formerly superintendent of the Holden (Mass.) municipal lighting department, has joined the engineering staff of the commercial and industrial department of Charles H. Tenney & Company, Boston.

B. M. Fast, who for the past fourteen years has been associated with the Penn Electric Corporation as superintendent of new business and power engineer at Erie, Pa., has been transferred to the New York office of the Associated Gas & Electric Company, now owners of the Penn Electric Corporation, as sales manager for the entire Associated system. Mr. Fast will collaborate with the local managers of the various Associated properties, spending most of his time in the field. He had some experience in sales work before affiliating himself with the Penn Electric Corporation in 1912. Following graduation from the University of Illinois in 1909 as electrical engineer he spent one year with the Hodenpyl, Hardy & Walbridge Company in the new-business department of their Peoria and Springfield (Ill.) properties, subsequently joining the power sales department of the Empire District Electric Company, Joplin, Mo., a Henry L. Doherty property.

Frank W. Peek, Jr., consulting engineer of the General Electric Company in charge of the company's high-voltage experimental laboratory at Pittsfield, Mass., was made the recipient of the Levy gold medal by the Franklin Institute of Philadelphia. This award, founded by Louis Edward Levy, was given Mr. Peek in recognition of his paper presented a year ago before the institute on "High-Voltage Phenomena." Mr. Peek is one of the world's best known figures in the investigation of artificial lightning and high voltages. He has produced in the General Electric's laboratory voltages greater than 2,000,000. Outstanding in his research work have been the formation and establishment of laws regarding corona, the investigation of lightning and its effect on high-voltage transmission, the study of dielectric phenomena, line insulations and problems connected with transmission of high-voltage currents.

Obituary

Ernest H. Elzemeyer, president of the American Pulverizer Company, St. Louis, died suddenly April 16 in his sixty-first year.

Sidney W. Bishop, executive manager of the Electrical League of Colorado, died at St. Joseph's Hospital, Denver, May 13, as the result of an operation. Mr. Bishop joined the Denver Electrical Co-operative League immediately after its inception in the summer of 1921, and it is due mainly to his efforts that the league has been one of the most successful co-operative movements inaugurated by the electrical industry. After taking over the management of the Electrical League of Colorado Mr. Bishop gained national recognition in that he was responsible for innovations that have been adopted throughout the country. Dozens of business buildings in Denver and other parts of the state and hundreds of homes regarded as almost perfect from the point of view of lighting can be credited to him. Mr. Bishop made a notable address at the annual meeting of the Rocky Mountain Electrical Co-operative League in Salt Lake City a few weeks ago. He was born in Denver in 1894 and was graduated from the University of Colorado. He had for several years acted as the chief Denver correspondent of the ELECTRICAL WORLD and the *Journal of Electricity.*

Financial and Corporate

Utility Market Improves

Wider Interest in Bonds Drives Many Issues Higher—Stocks Also Advance

FROM the standpoint of activity the market in public utility securities has not differed greatly from that in railroad and industrial issues, but the quietness of the trading has not in the case of utilities prevented prices from closing the week better than they began it. Continued ease in money, of which the country has an increasing rather than a decreasing supply, keeps rates for funds low, and that, in the absence of unfavorable news from the industry, has helped to stimulate prices somewhat.

Especially noteworthy is the improvement in the bond list of the public utility group, and among the issues that have gained ground may be mentioned Central States Electric 6's, Great Western Power 5's, Illinois Electric Power 7's, Commonwealth Power Corporation general 5's, Southern California Edison 5's and Southwestern Power & Light 5's.

Interest in the preferred stocks of the utility group continues with the improvement in the investment market generally, and gains were recorded for the week in American Public Utilities, Arizona Power, Galveston-Houston Electric, Southern California Edison and other preferred issues of that category.

Advances among the common stocks were limited to a point or a few points. Particular mention may be made of the fact that American Power & Light made its bow on the New York Stock Exchange after its long period in the unlisted market.

Appalachian Electric Power's Position

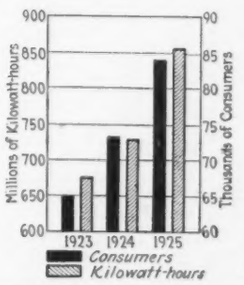
Biggest Subsidiary of American Gas & Electric Company Does an Annual Gross Business of More than $15,000,000

BY PAUL WILLARD GARRETT
Financial Editor *New York Evening Post*

ORGANIZED under the laws of Virginia in its present form this spring, the Appalachian Electric Power Company is the largest subsidiary of the American Gas & Electric Company. Its finances are under the supervision of the Electric Bond & Share Company.

Flotation recently of a thirty-five-million-dollar issue of first and refunding mortgage 5 per cent bonds, due in 1956, called attention to the interesting territory served by the Appalachian. Through merger or conveyance the new Appalachian system will operate numerous properties in western Virginia and western West Virginia. The system will include properties formerly owned by such companies as Appalachian Power Company, Appalachian Power & Light Company (formerly owned by the Virginian Company), Central Virginian Power Company, Consolidated Power & Light Company, Dunbar Light & Power Company, Interstate Power Company, Kanawha Valley Power Company, Kentucky & West Virginia Power Company, Inc., Lynchburg Traction & Light Company and the Roanoke Railway & Electric Company. Altogether more than 250 communities are served by the system.

Upon completion of the present financing, which was undertaken to round out the system and to provide for the acquisition of new properties,



CONSUMERS SERVED AND OUTPUT, INCLUDING PURCHASED POWER

the Appalachian Electric Power Company's financial set-up will include several bond and several stock issues. On the bond list will appear $23,991,000 of underlying bonds, $35,000,000 of first and refunding mortgage bonds, $4,000,000 of Appalachian Power Company debentures and $5,000,000 of 6 per cent notes that mature in 1929. No-par-value stock of varying amounts is outstanding as follows: 225,000 shares of $7 cumulative preferred stock, 100,000 shares of $7 cumulative second preferred and 5,000,000 shares of common stock.

What the earnings of the Appalachian Electric Power Corporation will be under the new structure is suggested by a study of past performances. Gross earnings for the twelve months ended Feb. 28, 1926, were $15,380,631, of which $7,474,502 was spent on operating expenses, maintenance and taxes, so that net earnings totaled $7,906,129. Annual interest requirements on the underlying divisional bonds and the new issue of first and refunding mortgage bonds will be $2,999,550, leaving a balance available for charges, renewals and replacement reserves of $4,906,579.

New Capital Issues

First mortgage gold bonds, series B, of the Iowa Power & Light Company were offered the investing public at 99 and accrued interest, to yield over 5.55 per cent, a piece of financing involving a total of $3,000,000. These bonds were dated May 1, 1926, and mature May 1, 1956.

The Central Maine Power Company floated an issue of first and general mortgage gold bonds, series D, amounting to $2,500,000, the price being 100 and interest, yielding 5 per cent.

The Indianapolis Power & Light Corporation, the organization of which was reported in the May 8 and 15 issues of the ELECTRICAL WORLD, issued 40,000 shares of $7 dividend first preferred stock. These shares were offered at $95 and accrued dividend, to yield about 7.37 per cent.

A one-million-dollar offering of 7 per cent cumulative preferred stock was was made by the Moloney Electric Company, manufacturer of transformers. This stock was offered at $100 per share and accrued dividends.

Westinghouse Sales Largest in Company's History

In the statement of operations for the fiscal year ended March 31, 1926, just issued, the Westinghouse Electric & Manufacturing Company reports sales billed amounting to $166,006,800, the largest total in the company's history. Cost of sales, depreciation, expenses and taxes, however, advanced propor-

Dividends Declared

The quarterly dividends listed below were recently announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
American Power & Light, com	.25	June 1
American Power & Light, com.*	....	June 1
American Superpower, com. A & B	.30	July 1
American Superpower, 1st pf	$1.50	July 1
Blackstone Valley Gas & Elec., com.	$1.25	June 1
Blackstone Valley Gas & Elec., pf.	3	June 1
Brooklyn Edison	2	June 1
Central Illinois Pub. Serv., pf	$1.50	July 15
Central Indiana Power, pf	1¾	June 1
Consol. Gas, Elec. Lt. & Pwr., com.	.62½	July 1
Consol. Gas, Elec. Lt. & Pwr., pf. A.	2	July 1
Consol Gas, Elec. Lt. & Pwr., pf. B.	1¾	July 1
Consol. Gas, Elec. Lt. & Pwr., pf., C.	1¾	July 1
Consol. Gas, Elec. Lt. & Pwr., pf. D	1¾	July 1
Continental Gas & Elec., pf	1¾	July 1
Duquesne Light, 1st pf	1¾	June 15
Fairbanks, Morse, pf	1¾	June 1
Fairbanks, Morse, pf	1¾	Sept. 1
Fairbanks, Morse, pf	1¾	Dec. 1
Federal Light & Trac., com	.20	July 1
Federal Light & Trac., com.†	.15	July 1
Federal Light & Trac., pf	1¾	June 1
Georgia Railway & Electric, com	2	May 20
Ingersoll-Rand, com	.75	June 1
Middle West Util. pr. ln. cap	$2	June 15
Nebraska Power, pf	1¾	June 1
North American Edison, pf	$1.50	June 1
Oklahoma Gas & Electric, pf	1¾	June 15
Philadelphia Electric	.50	June 15
Portland Electric Power, 2nd pf	1¼	June 1
Radio Corp. of America, pf	.87½	July 1
Southwestern Power & Light, pf	1¾	June 1
Standard Gas & Elec., com	.75	July 25
Standard Gas & Electric., com.†	.50	July 25
Standard Gas & Electric., com.†	.25	Oct. 25
Standard Gas & Electric, com.†	.25	Jan. 25 '27
Standard Gas & Electric, 8% pf	2	June 15
Timken Roller Bearing	.75	June 5
Timken Roller Bearing, extra	.25	June 5
United Electric Light, com	$2.50	May 15
United Electric Light, pf	1¾	May 15
White (J. G.) & Co., pf	1¾	June 1
White (J. G.) Engineering, pf	1¾	June 1
White (J. G.) Mgt. Corp., pf	1¾	June 1

* One-fiftieth share com. stk. † Payable in com. stk.

tionately from $144,242,065 in the year ended March 31, 1925, to $151,711,939 during the following year. Net income available for dividends and other purposes amounted to $14,122,001 against $15,324,364 in 1925 and represented 11.9 per cent on the capital stock of $118,503,150. Current assets totaled $137,336,122 as compared with current liabilities of $18,432,074. The value of new orders booked during the year showed a substantial increase over the previous year. After adjustments, the value of unfilled orders at the end of the fiscal year was $55,163,247.

Illinois Utility to Change Dividend Rate.—A special meeting of stockholders of the Illinois Power & Light Corporation has been called for July 14 at Chicago for the purpose of approving a change in the dividend rate upon the unissued 70,000 shares of the preferred stock of the corporation from 7 per cent to 6 per cent per annum. The proposed issue of 6 per cent preferred stock will have the same rights, privileges, preferences and restrictions as the present issue of 7 per cent cumulative shares.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday May 15	Low 1926	High 1926
STOCKS			
ABITIBI PWR. & PAPER, com. —no par	k 71¼	71¼	84¼
Adirondack Pwr. & Lt.—7% pf.	k102	....	....
Adirondack Pwr. & Lt.—8% pf.	109	108	110
Ala. Pwr., pf.	k105½	....	....
Allis-Chalmers Mfg. pf.	k109	105	110
Allis-Chalmers Mfg., com.	80¼	78¼	94¼
Aluminum Co. of Amer., com.	k 63	....	....
Aluminum Co. of Amer. new, pf.	k 98	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m108	108	131
Amer. & Foreign Pwr., 7% pf.—no par	k90	89	98
Amer. & Foreign Pwr., com.—no par	k 17½	17	42¾
Amer. Bosch Magneto, com—no par	k 17	16¾	34¾
Amer. Brown Boveri, Elec.	k 34½	30¾	48¾
Amer. Brown Boveri Elec pf.	k 95½	86	97¼
Amer. Elec. pwr., pf.	c110½	102½	111¾
Amer. Gas & Elec., 6% pf.—no par.	k 92	90¼	95¼
Amer. Gas & Elec., com.—no par.	k 73½	64	99¼
Amer. Lt. & Trac., 6% pf.	k106	105	116¼
Amer. Lt. & Trac., com.	k204	195	263
Amer. Pwr. & Lt., 6% pf.	k 92½	....	....
Amer. Pwr. & Lt., com.—no par.	k 51½	51¼	53¼
Amer. Pub. Serv., 7% pf.	k 94	....	....
Amer. Pub. Serv., com.	47	45	80
Amer. Pub. Utilities, 6% pf.	k 85	....	....
Amer. Pub. Utilities, 7% pf.	k 88	....	....
Amer. Pub. Utilities, com.	70	80	82
Amer. States Sec., A	a 2½	1¼	8¼
Amer. States Sec. B	a 2½	1	5¼
Amer. Superpwr., pf.—25	24½	23	26¾
Amer. Superpower, pf.	92	90	94
Amer. Superpwr., Class A—no par.	k 21	19¼	37¾
Amer. Superpwr., Class B—no par.	k 22½	21¼	39
Amer. Wtr. Wks. & Elec., 7% pf.	102½	101¼	108¾
Amer. Wtr. Wks. & Elec., com.—20.	k 47¼	43¾	74
Anaconda Copper	k 45½	41¼	61
Appalachian Pwr., 7% pf.	100	99	101
Appalachian Pwr., 1st pf., 7%	100	99	101
Appalachian Pwr., com.	80	80	83
Arizona Pwr., 7% pf.	k 78	....	....
Arizona Pwr., com.	m 27	27	35½
Arkansas Cent. Pwr., pf., $7—no par	102	99	102
Arkansas Lt. & Pwr., 7% pf.	k 97	....	....
Arkansas Lt. & Pwr., com.	100	110	115
Asheville Pwr. & Lt., 7% pf.	l104½	100½	105½
Assoc. G.&E., pf.—$3.50—50	k 50	....	....
Assoc. Gas & Elec., pf.—$6—no par	k 82	....	....
Assoc. Gas & Elec., Class A—no par	k 29½	25½	35½
BABCOCK & WILCOX, com.	k113	....	....
Binghamton Lt., Ht. & Pwr., pf.	105	....	....
Birmingham Elec. pf.—$7—no par.	102	101	103½
Blackstone Valley Gas & Elec., pf.	92	90	106
Blackstone Valley G.&E., com.—50.	95	....	....
Blaw-Knox, com.	f 52	45	56
Brazilian Trac., Lt. & Pwr., com.	f 95½	....	....
Broad River Pwr., pf.	k 93	....	....
Brooklyn Edison, com.	138	133	146½
Buffalo, Niagara & East. Pwr., pf.—25	k 24	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par.	k 26½	....	....
CALIFORNIA ELEC. GENERATING, pf.	93	89	93
California Ry. & Pwr., pf.	105	88	115
Carolina Pwr. & Lt., pf.—$7—no par	104	102	107
Cent. & S. W. Ut. 7% pf.—no par	a 90½	89½	95
Cent. & S. W. Ut., pr. ln. pf.—no par	a 95	94	100
Central Ariz. Lt. & Pwr., pf.	102	....	....
Central Ark. Ry. & Lt., 7% pf.	k 98	....	....
Central Ill. Pub. Serv., 6% pf.	88	89	91
Central Ind. Pwr., 7% pf.	88	88	93½
Central Pwr. & Lt., pf.	95	94	98½
Central States Elec., 7% pf.	k 93	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	m116	110	116
Chicago Fuse Mfg., com., no par.	a 32	30¼	35
Cincinnati Gas & Elec., com	g 90	88	93½
Cities Service, 6% pf.	85	82¼	85½
Cities Service, pf.B—10.	7½	7½	7
Cities Service, pf. BB—100.	74	74	76
Cities Service, com.—20.	40½	37¼	42½
Cities Service, Bks. Shrs.—10.	k 20	....	....
Clarion River Pwr., pf.	93	93	95
Cleveland Elec. Illu., 6% pf.	105	103	105½
Cleveland Elec., Illg., com.	k225	....	....
Colorado Pwr., 7% pf.	k 96	....	....
Columbia Gas & Elec., 7% pf.	113	112	115
Columbia Gas & E., com.—no par.	k 75½	63¼	90
Columbia Ry., Gas & Elec., 6% pf.	65	65	96
Columbus Elec. & Pwr., 2d pf.	k103	....	....
Columbus Elec. & Pwr., com.	k250	....	....
Columbus Ry., Pwr. & Lt., 1st. pf.	97½	98	99
Columbus Ry., Pwr. & Lt., pf. B.	95	92	95
Col. Ry., Pwr. & Lt., com.—no par.	82	82	85
Commonwealth Edison, com.	a138½	137¼	144
Commonwealth Pwr., 6% pf.	k 85	....	....
Commonwealth Pwr., com—no par.	k 33½	28¼	42¾
Conn. Lt. & Pwr., 8% pf.	116	117	121
Conn. Lt. & Pwr., 7% pf.	107	108	113
Cons. Gas of N. Y., pf.—50.	k 57½	....	....
Cons. Gas of N.Y., com.—no par.	k 91½	87	104½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	104	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti 6½% pf.	c110½	108½	110½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	100	109	112
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e127½	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par	e 49½	45	57½
Cons. Pwr. & Lt., 7% pf.	104	100	107
Consumers Pwr., 6% pf.	97	95	98
Consumers Pwr., 6.6% pf.	103	101½	103½
Continental Gas & Elec., 7% ptc. pf	k 97	....	....
Continental Gas & Elec., 7% pr. pf.	k 95½	....	....
Continental G.&E., com.—no par.	100	85	150
Crocker Wheeler, com.	14	14	19
Crocker Wheeler, pf.	50	50	55
DALLAS PWR. & LT., 7% pf.	102	102	104
Dayton Pwr. & Lt., 6% pf.	99	95	97
Detroit Edison, com.	k129	123¼	141¼
Dubilier Condenser & Radio, com. no par	6½	4¼	11
Dubuque Elec., 6% pf.	96	93	97
Duquesne Lt., 7% pf.	114	111¼	116½
EAST, N. Y. UTIL. pf.	80	80	85
Eastern New York Util., com.	65	70	75
Eastern States Power	14	23	32¼
Eastern States Pwr., pf	k 87	....	....
Eastern Tex. Elec., 7% pf.	k103	....	....
East. Tex. Elec., com.—no par	75	103	107
Edison Elec. Illum. of Boston, com.	d219	207	250
E. Paso Elec., com.—no par	70	70	94
E. Paso Elec. pf.	101	102	104
Elec. Bond & Share, 6% pf.	l106½	103¼	107½
E. Bd. & Share Sec., com.—no par.	f 65	56¼	86
El. Household Util.	a 16½	14¼	25
Elec. Investors, 6% pf.—no par.	m89	92	95
Elec. Investors, com.—no par.	34	30¼	74½
Elec. Investors, 10% pd. receipts.	m18	....	....
Elec. Pwr. & Lt., ctfs., pf.	k 92½	89¼	97½
Elec. Pwr. & Lt., ctfs., 40% pd.	101½	99¼	115
Elec. Pwr. & Lt., ctfs. full pd.	105	103	110½
Elec. Pwr. & Lt., ctfs., com.—no par	k 17½	17¼	34½
Elec. Ry. Securities, com.—no par.	m6	4½	10
Elec. Refrig.	k 64½	63	67½
Elec. Storage Battery, com.—no par.	k 76½	71½	79½
Elmira Wtr., Lt. & R. R., 7% pf.	98	97½	99½
Emerson Elec. pf.	m103	100	104½
Empire Dist. Elec., 6% pf.	80	80	85
Empire Pwr., A.	k 21	....	....
Eng. Pub. Serv., pf.—no par.	99	99½	104½
Engr. Pub. Serv., com.—no par.	k 23½	21	29¼
Eureka Vac. Cleaner, com.—no par.	k 45	45	53½
FAIRBANKS MORSE, com—no par	49	46	59¾
Fairbanks Morse, pf.	115	108½	115
Federal Lt. & Trac., com.	k 29	28	39¼
Federal Light & Traction, pf.	k 89	87	89
Federal Utilities, pf.	k 70	....	....
Federal Utilities, com.	k 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l105	105	108
GALVESTON-HOUSTON ELEC., 6% pf.	k 45	....	....
Galveston-Hstn El., com.	k 15	....	....
Gen. Elec., w.i.	k 78½	77	83½
Gen. Elec., com.	k312½	285	386¼
Gen. Elec., special—10.	k 11½	11	11¾
Gen. G.&E., (Del.) com. A no par.	36¼	34	59
Gen. G.&E., (Del.) com. B no par.	k 31	....	....
Gen. G.&E., (Del.) A pf. $8—no par	107	105½	110½
Gen. G.&E., (Del.) A pf. $7—no par	96	95	99¼
Gen. G.&E., (Del.) B pf.	m 94	92½	96
General Public Service, pf.	m101	100	106½
General Public Service, com.	m 12½	12¼	16¾
Ga. Lt., Pwr & Rys., 6% pf.	82	82	85
Ga. Lt., Pwr. & Rys., com.	m 57¾	56¼	73¾
Ga. Ry. & Pwr., 8% pf.	110	112	114
Ga. Ry. & Pwr., 7% pf.	100	101½	103
Ga. Ry. & Pwr., 4% pf.	m133	....	....
Ga. Ry. & Pwr., com.	k115	....	....
Gt. Western Pwr., 7% pf.	k101½	....	....
HAVANA ELEC. UTIL., com.	39	37¼	44¾
Havana Elec. Util., pf.	70½	64¼	71¾
IDAHO PWR., 7% pf.	102	103	104
Ill. No. Utilities, 6% pf.	90	88	92
Ill. Pwr. & Lt., 7% pf.	k 97	....	....
Ingersoll Rand	90	80½	104
Int. Combus. Engr., com.—no par.	k 43½	33¼	64½
Int. Utilities, class A—no par.	k 31	31	39
Int. Utilities, class B—no par.	k 5½	4¼	9¾
Interstate Pwr., pf., $7 no par.	k 93	....	....
Interstate Pub. Serv., 7% pf.	96	96½	97
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT. 7% pf.	94	95	97½
Jersey Central Pwr. & Lt., ptc. pf.	95½	95½	96½
Jersey Central Pwr. & Lt., com.—no par	45	45	50
Johns-Manville, com.—no par.	k142	130	153
KANSAS CITY PWR. & LT., pf.	110½	107½	111
Kansas Gas & Elec., 7% pf.	l101½	99	102
Kentucky Hydro-Elec., pf.	a 93½	91½	95
Kentucky Sec., 6% pf.	77	75	77
Kentucky Sec., com.	100	90	100
Kentucky Utilities, 6% pf.	90	90	95
Keystone Pwr. & Lt., 7% pf.	95	95	97
Kings County Ltg., 7% pf.	101	101	106
Kings County Ltg., 8% pf.	103	105	108
LACLEDE GAS LT., com.	152	146	168
Lehigh Pwr. Sec., com.—no par.	k 12½	10	23
Long Island Ltg., 7% pf.	104	105	107
Long Island Ltg., com.—no par.	115	120	150
Los Angeles Gas & Elec., 6% pf.	k 96	....	....
Louisville Gas & Elec., Class. A	k 24	22½	26½
MANHATTAN ELEC. SUPPLY	k 69½	56	76½
Manila Elec., com.—no par.	k 38	27½	39
Maytag Mfg., com.	k 20½	19	23¼
Memphis Pwr. & Lt., pf., $7, no par	104	103	105
Metro. Edison, pf.—$6—no par.	k 92	....	....
Metropolitan Edison, pf., $7, no par.	103	102	106
Metropolitan Edison, com., no par.	45	45	50
Middle West Utilities, 7% pf.	a104½	97¼	111¼
Middle West Utilities, 7% pr. lien pf.	a115	106¼	123¾
Middle West Utilities, com.—no par.	a110½	108	134¼
Midland Utilities, pr. ln. pf.	a 98½	98	100
Midland Utilities pf. A.	a 96	96	98
Milwaukee Elec. Ry. & Lt., 7% pf.	100	....	....
Milwaukee Elec. Ry. & Lt., 6% pf.	91	....	....
Minn. Pwr. & Lt., 7% pf.	l102	100	103½
Miss. Pwr. & Lt., pf.	k101	....	....
Miss. River Pwr., 6% pf.	93	94	96
Miss. River Pwr., com.	k 60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	101	101	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	k 94	....	....
Mohawk Hudson Pwr., com.—no par	k 21½	....	....
Montana Pwr., pf.	m114	112½	119¼
Montana Pwr., com.	77½	69¼	83¼
Montreal Pwr., com.	f 224	....	....
Mountain States Pwr., pf.	k 96	....	....
Mountain States Pwr., com.	k 20	....	....
NASSAU & SUFFOLK, LTG., pf.	95	93	95
National Carbon, pf.	a127	125	128
National Elec. Pwr., pf.	m100	93	95
National Electric Pwr-A	a 21½	19¼	26
Nat.-Lt., Ht. & Pwr., com.—no par.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	k 98½	96	102½
National Pwr. & Lt., com.—no par.	k 18	16½	38¼
National Pub. Serv., 7% pf.	91	90	94
National Pub. Serv., ptc. pf.	95	96	97½
National Pub. Serv., A com.—no par	19½	15½	24
National Pub. Serv., B com.—no par	10½	10	12¾
Nebraska Pwr., 7% pf.	l103½	103	105½
Nevada-Calif. Elec., com.	m 23	18¼	44¼
New Brunswick Pwr., pf.	35	30	40
New England Pub. Serv., pr. ln. pf.	97	98	99½
New England Pub. Serv., pf.	88	95½	97
N. J. Pwr. & Lt., 7% pf.	105	104	108
New Orleans Pub. Serv., 7% pf.	100	100	102
N.Y.& Queens Elec.Lt.& Pwr.,5% pf	88	89	90
N. Y. Central Elec., 7% pf.	96	98	100
Newport News & Hampton Ry., Gas & Elec., com.	110	108	112
Newport News & Hampton Ry., Gas & Elec., pf.	110	109	114
Niagara Falls Pwr., 7% pf.—25.	28½	27½	28¾
Niagara, Lock. & Ont. Pwr., 7% pf.	108	110	111½
Niagara, Lock. & Ont. Pwr., com.—no par.	m 60½	n 60	n 73
No. Amer., 6% pf.—50.	k 50½	49	50½
No. Amer., com.—10.	k 46½	42	67
No. Amer. Edison pf.—no par.	90	93	95
No. Amer., Lt. & Pwr., pf.	93	88	90
No. American Utilities, pf., full pd.	m 94½	89	96
No. American Utilities, pf., 25% pd.	m 19	18	27
N.C. Pub. Serv., pf.—$7—no par.	k 90	....	....
Northeastern Pwr., com.	k 19	17½	36½
No. Indiana Gas & Elec., pf. A.	96	98	100
No. N. Y. Utilities, 7% pf.	k102½	....	....
No. Ohio Pwr., com.—no par.	k 13½	11	26½
No. Ohio Trac. & Lt., 6% pf.	75	78	81
No. Ohio Trac. & Lt., 7% pf.	85	88	91
No. Ont. Lt. & Pwr., pf.	k 70	....	....
No. Ont. Lt. & Pwr., com.	72	45	70
No. States Pwr., 7% pf.	k101½	99½	102½
No. States Pwr. com.	k 99½	97	136½
No. Texas Elec., 6% pf.	k 43	....	....
No. Texas Elec., com.	k 25	....	....
OHIO BRASS, com. B—no par.	74	70	79
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	92	92	95
Ohio Pwr., 6% pf.	93	93	95
Ohio Pub. Serv., 6% pf.	90	90	93
Ohio Pub. Serv., 7% pf.	99	98½	100
Ohio River Edison, pf.	99	99½	101½
Oklahoma Gas & Elec., pf.	k 96	....	....
PACIFIC GAS & ELEC., 6% pf.	k 98½	....	....
Pacific Gas & Elec. com.	122½	118	132½
Pacific Pwr. & Lt., 7% pf.	l 99	98	101¼
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt. & Pwr., pf.—no par	c 72½	71	91
Penn-Ohio Edison, 7% pf.	94	95½	97½
Penn-Ohio Elec., 7% pf.	94	93	96

Stock Exchange: cChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Tuesday, May 18. lBid, low, high, Wednesday, May 19. mLtest quotations available. n1925.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday May 15	Low 1926	High 1926
STOCKS—Continued			
Penn-Ohio Pwr. & Lt., 7% pf	95½	94	97
Penn-Ohio Pwr. & Lt., 8% pf	103	100	106
Penn Pwr. & Lt.—$7—no par	*l*105½	103	106½
Penn Pub. Serv., 7% pf	98	96	100
Penn Pub. Serv., 6% pf	85	85	90
Penn Wtr. & Pwr., com	*k*138	130½	174
Phila. Co., 6% pf.—50	*k* 49½	47½	50½
Phila. Co., com.—50	*k* 73½	59½	76½
Phila. Elec., com.—25	*c* 45½	41½	67½
Pittsburgh Utilities, pf.—10	*k* 20	14½	20
Portland Elec. Pwr., 7% pf	97	97	98
Portland Elec. Pwr., 6% pf	75	71	75½
Portland Elec. Pwr., 6% 2d pf	71	71	75
Portland Elec. Pwr., com	*k* 36	....	....
Potomac Elec. Pwr., pf	*j*108½	....	....
Pwr. Corp. of N.Y., com—no par	*m* 79	77½	90½
Pwr. Sec., pf.—no par	*k* 15	....	....
Pwr. Sec., com.—no par	*k* 5	....	....
Pub. Serv. of N. J., 7% pf	105½	103½	108½
Pub. Serv. of N. J., 8% pf	118	115	120
Pub. Serv. of N. J., com.—no par	*k* 79	72	92½
Pub. Serv. of No. Ill., 6% pf	*a*101	100½	103
Public Serv. of No. Ill., 7% pf	*a*114½	112	116½
Pub. Serv. of No. Ill., com.—no par	*a*128½	128½	137
Pub. Serv. of No. Ill., com	*a*129	128½	131½
Pub. Serv. of Okla., 7% pf	95	92	95
Pub. Serv. Elec. & Gas, 6% pf	100	97	101½
Public Service Elec. Pwr., pf	110	106	110
Puget Sound Pwr. & Lt., 7% pf	*k*105	....	....
Puget Sound Pwr. & Lt., 6% pf	*k* 83	....	....
Puget Sound Pwr. & Lt., com	*k* 47½	45	66½
RADIO CORP. OF AM., pf.—50	*k* 46½	44½	47½
Radio Corp. of Amer., com.—no par	*k* 43½	32	46½
Republic Ry. & Lt., pf	*k*104	....	....
Republic Ry. & Lt., com	*k* 84	....	....
Rochester Gas & Elec., 5% pf	95	80	98
Rochester Gas & Elec., 6% pf	98	100	102
Rochester Gas & Elec., 7% pf	105	105	107
SAN JOAQUIN LT. & PWR., 7% pf	97	97½	98½
St. Joseph Ry., Lt., Ht. & Pwr., pf	65	60	65
Servel Corp., Class A	*k* 21	15½	30½
Servel Corp., Class B—no par	*k* 40	....	....
Sierra Pacific Elec., com	*k* 25	....	....
Sioux City Gas & Elec., 7% pf	97	96	98
S. E. Pwr. & Lt., pf —$7—no par	98	97	100
Southeastern Pwr. & Lt., pfc. pf	63	60	67½
S. E. Pwr. & Lt., com.—no par	*k* 26½	20	46½
So. Calif. Edison, 8% pf	130	135	140
So. Calif. Edison, 7% pf	*k*112	....	....
So. Calif. Edison, 6% pf	*k* 99	....	....
So. Calif. Edison, com	*k*115	115½	142
Southern Cities Utilities, 7% pf	*k* 85	....	....
Southern Cities Utilities, com	*k* 31	....	....
Southwestern Lt. & Pwr., A	*k* 55	....	....
Southwestern Lt. & Pwr., B	*k* 45	....	....
Southwestern Lt. & Pwr., $6 pf	*k* 81	....	....
Southwestern Pwr. & Lt., 7% pf	*k* 99	....	....
Springfield (Mo.) Ry. & Lt., 7% pf	95	....	....
Standard Gas & Elec., 8% pf	*k* 56	53½	57½
Standard Gas & Elec., 7% pf	*k*100	....	....
Standard Gas & Elec., com—no par	*k* 53½	51	69
Standard Pwr. & Lt., 7% pf	*k* 91	....	....
Staten Island Edison, pf.—$6—no par	93	93	95
Superheater, com.—no par	*k*140	....	....
Syracuse Lighting, 7% pf	102	105	107
Syracuse Lighting, 8% pf	115	....	....
Syracuse Lighting, com	295	260	315
TAMPA ELEC., com	275	270	315
Tampa Elec., com., new	*k* 66	....	....
Tenn. Elec. Pwr., 6% pf	*k* 85	....	....
Tenn. Elec. Pwr., 7% pf	*k*100	....	....
Terre Haute, Ind. & East Trac., pf	20	23	37
Terre Haute, Ind. & East. Trac., com	3	3	5
Tex. Pwr. & Lt., 7% pf	*l*104½	102	105
Tide Water Pwr., 8% pf	*k*101½	....	....
Timken Roller Bearing, com—no par	*k* 48½	44½	56½
Toledo Edison, 8% pf	113	112	114
Toledo Edison, 7% pf	102	101	103
Toledo Edison, com	100	....	....
Tri-City Ry. & Lt., 6% pf	89	87½	89
UNITED GAS & ELEC., 6% pf	94	94	97
United Gas & Elec., com.—no par	*m*57	56	66
United Gas & Elec. (N.J.), 5% pf	68	70	75
United Gas Impr.—50	*c* 97	84½	144½
United Lt. & Pwr., pf.—$4—no par	44	....	51
United L. & P. pf.—$6.50—no par	84	81	91
United Lt. & Pwr., com. A.—no par, new	14	12½	28
United Lt. & Pwr., com., B—no par	*m*60	140	165
Utah Pwr. & Lt., 7% pf	*l*101½	99	103½
Utica Gas & Elec., 7% pf	104½	103	105
Utica Gas & Elec., com	200	....	....
Utilities Pwr., & Lt., 7% pf	*k* 93	....	....
Utilities Pwr. & Lt., com A	*k* 30½	28½	37
Utilities Pwr. & Lt., com. B—no par	*m*15½	14	18
VERMONT HYDRO - ELEC., 7% pf	94	95	96
Virginian Pwr., 7% pf	108	102	104
Virginian Pwr., com	68	....	....
Virginia Elec. & Pwr., 7% pf	103	101	103½
WAGNER ELEC., pf	*b* 69½	69½	85
Wagner Elec., com.—no par	*b* 22	20	34½
Washington Ry. & Elec., com	*j*180	....	....
Washington Ry. & Elec., pf	*j* 91	....	....
Washington Wtr. Pwr., com	123	130	134
West Mo. Pwr., 7% pf	*k* 91	....	....
West Penn., 7% pf. temp. ctfs	*m*100	95½	101
West Penn, com	*m*125	118	130
West Penn Elec., pf	98	96½	100½
West Penn Elec., Class A	91½	88½	97
West Penn Pwr., pf	108	108	112
West Va. Lt., Ht. & Pwr., 7% pf	95	95	98
West Va. Utilities, 7% pf.—50	42	43	45
Western Pwr., 7% pf	*k* 95	....	....
Western States Gas & Elec., 7% pf	*k* 90	....	....
Western States Gas & Elec., com	*k* 17	....	....
Westinghouse El. & Mfg., com—50	*k* 67½	65½	79½
Weston Elec. Instrument, Class. A	29	27½	31½
Weston Elec. Instrument, com	*k* 14½	13½	19
Wheeling Elec., pf	90	91	93½
Wis. Pwr., Lt. & Ht., 7% pf	90	85	90
Worthington Pump, pf., A	73	72½	80
Worthington Pump, pf. B	54	53	65
Worthingington Pump, com	*k* 24½	20½	44½
YADKIN RIVER PWR., 7% pf	*l*104½	102	105
Yale & Towne, com.—25	*k* 66	60½	66½
BONDS			
ABITIBI PWR. & PAPER	6s 1940	*k*101½	....
Adir. Elec. Pwr	5s 1962	*k*101½	....
Adir. Pwr. & Lt	6s 1950	*k*106½	....
Adir. Pwr. & Lt	5s 1930	97	97 97
Ala. Pwr	5s 1946	100½	99 100½
Ala. Pwr	5s 1951	98	97 99½
Ala. Pwr	6s 1951	104½	104½ 105½
Ala. Trac., Lt. & Pwr	5s 1962	*m*111	112 124
Aluminum Co. of Amer	7s 1933	*k*107	106½ 107½
Amer. Gas & Elec	5s 2007	93	92 93
Amer. Gas & Elec	6s 2014	*k*100½	98 100½
Amer. Pwr. & Lt	6s 2016	*k* 99	96 98½
Amer. Pub. Serv	6s 1942	100½	98½ 100½
Amer. Wtr. Wks. & Elec	5s 1934	*k* 97½	....
Amer. Wtr. Wks. & Elec	6s 1975	*k* 94½	92½ 94½
Anaconda Copper	6s 1929	102½	102½ 103½
Anaconda Copper	6s 1953	*k*103½	....
Anaconda Copper	7s 1938	*k*105½	....
Appalachian Pwr	5s 1941	*k*100½	....
Appalachian Pwr	6s 2024	95½	93½ 95½
Appalachian Pwr	7s 1936	107	105 107½
Arizona Pwr	6s 1933	100½	99½ 101
Arizona Pwr	6s 1947	96½	95½ 97
Ark. Central Pwr	6s 1948	103	102 103½
Ark. Lt. & Pwr	6s 1945	*k*103½	....
Ark. Lt. & Pwr	6s 1954	*k*100½	....
Assoc. Gas & Elec	6s 1965	*k* 94	92½ 94½
Assoc. Gas & Elec	6½s 1954	*k*102	....
BERLIN CITY ELEC.	6½s 1928	99½	98 100
Berlin City Elec	6½s 1929	97½	97 98½
Binghamton Lt., Ht. & Pwr	5s 1946	*k* 99½	....
Birmingham Elec	6s 1954	103½	102½ 104
Birmingham Ry., L. & P	4½s 1954	92	88 92½
Broad River Power	5s 1954	90	91 92
Broad River Pwr	6½s 1934	100½	100 102
Brooklyn Edison	5s 1949	*k*104½	....
Brooklyn Edison	6s 1930	104½	103½ 106½
Buffalo Gen. Elec. 1st	5s 1939	102½	101½ 102½
Buffalo G. E., 1st & Ref	5s 1939	101½	101½ 102½
Buffalo G. E.	5s 1956	102½	99½ 102½
Burlington Ry. & Lt	5s 1932	96½	96 97½
Butte Elec. & Pwr	5s 1951	*k*101	....
CALIF. ELEC. GEN	5s 1948	*k*101	....
Calif. Gas & Elec	5s 1937	101½	100½ 102
Calumet Gas & Elec	5½s 1960	99½	97½ 99
Canadian Lt. & Pwr	5s 1949	57	56 64
Canton Elec	5s 1937	100½	100 101
Carolina Pwr. & Lt	5s 1938	101	100½ 102½
Carolina Pwr. & Lt	5s 1956	*k* 98½	97½ 99½
Carolina Pwr. & Lt	6s 1953	*m*104	104½ 105½
Cedar Rap. Mfg. & Pwr	5s 1953	100½	99½ 101½
Central Ark. Ry. & Lt	5s 1928	99½	99 100½
Central Ga. Pwr	5s 1938	96½	95 96½
Central Ill. Lt	5s 1943	*k*100½	....
Central Ill. Pub. Serv	5s 1952	93½	92 93½
Central Ill. Pub. Serv	5½s 1950	97½	96 97½
Central Ill. Pub. Serv	6s 1944	100½	99 101½
Central Ind. Pwr	6s 1947	99½	98 99½
Central Ia. Pwr. & Lt	6s 1944	100	99½ 101
Central Maine Power	5s 1939	99½	98½ 100
Central N. Y. Gas & El	5s 1941	*k* 98	....
Central Pwr. & Lt	6s 1946	*m*101½	....
Central Pwr. & Lt	6½s 1952	*k*105½	....
Central States Elec	6s 1945	92½	91 98½
Chattanooga Ry. & Lt	5s 1956	89½	81 90
Cincinnati Gas & Elec	5s 1956	100½	102 103½
Cincinnati Gas & Elec	5½s 1961	105½	102½ 105½
Cities Service	6s 1966	*k* 92½	91½ 94
Cities Service	7sB 1966	*k*186	....
Cities Service	7sC 1966	129½	125½ 131
Cities Service	7sD 1966	*k*104½	101½ 104½
Cities Service	7sE 1966	*k*109	....
Cities Service Pwr. & Lt	6s 1944	*k* 95½	95½ 96
City L. & T. Sedalia, Mo	5s 1952	84½	83 85½
Cleveland Elec. Illum	5s 1939	103	102½ 103½
Cleveland Elec. Illum	5s 1954	*k*103½	....
Cleveland Elec. Illum	7s 1941	111	110 112
Colorado Pwr	5s 1953	98½	95½ 99
Columbia Gas & Elec	5s 1927	*k*100½	....
Columbia Ry., Gas & El	5s 1936	94	92½ 95
Columbus, Dela. & Marion Elec	5s 1937	86	83½ 86
Columbus, Dela. & Marion Elec	6s 1937	94½	93½ 96
Columbus Elec. & Pwr	6s 1947	*k*103	....
Columbus Ry., Pwr. & Lt	5s 1940	*k* 98	....
Columbus Ry., Pwr. & Lt	6s 1941	*k*104	....
Commonwealth Edison	5s 1943	*a*102½	100½ 102½
Commonwealth Edison	5s 1953	101½	101½ 102
Commonwealth Edison	5s 1954	*k*102	....
Commonwealth Pwr	5s 1939	*k* 93	....
Commonwealth Pwr	6s 1972	*k* 97½	....
Commonwealth Pwr. & Lt	6s 1947	*k*104½	....
Community Pwr. & Lt.	6s 1950	100	98 100½
Conn. Ry. & Ltg	4½s 1951	90	90 92
Consol. Cities Lt., Pwr. & Trac	5s 1962	80½	80 82½
Consol. Elec	5s 1955	97½	98 99
Consol. Gas of N. Y	5½s 1945	*k*106	....
Con. Gas. Elec. Lt. & Pwr. of Balti	4½s 1935	*c* 98	95½ 98½
Con. Gas. Elec. Lt. & Pwr. of Balti. (notes)	6s 1949	*c*107½	105½ 107½
Con. Gas. Elec. Lt. & Pwr. of Balti	5s 1965	*c*101½	100½ 101½
Con. Gas. Elec. Lt. & Pwr. of Balti. (notes)	5½s 1952	*c*105½	104½ 105½
Con. Gas. Elec. Lt. & Pwr. of Balti. (notes)	6½s 1951	*m*109½	109 109½
Consumers Elec. L. & P	5s 1936	*k* 97½	....
Consumers Pwr	5s 1936	*k*101	....
Consumers Pwr	5s 1952	*k*101½	....
Consumers Pwr	5½s 1954	*k*104½	....
Continental Gas & Elec	5s 1927	*k*100	....
Continental Gas & Elec	6s 1947	*k*101½	....
Continental Gas & Elec	6½s 1964	*k* 99	....
Continental Gas & Elec	7s 1954	*k*106	....
Cumberland Cty. Pw. & Lt	5s 1942	97	94 97½
DALLAS PWR. & LT	6s 1949	104½	104 105
Dayton Ltg	5s 1937	100	100 101
Dayton Pwr. & Lt	5s 1941	102	100 102½
Defiance Gas & Elec	5s 1942	98½	98 99
Denver Gas & Elec	5s 1949	99	98 100
Denver Gas & Elec. Lt	5s 1951	97½	94 97½
Des Moines Elec	5s 1938	101	99 101
Detroit Edison	5s 1933	102½	101 102½
Detroit Edison	5s 1940	*k*103	....
Detroit Edison	5s 1949	*m*102	100 102½
Detroit Edison	5s 1955	*k*102½	....
Detroit Edison	6s 1932	*m*124½	124½ 135
Detroit Edison	6s 1940	*k*108	....
Detroit Edison	7s 1928	*m*131½	124½ 134
Detroit Edison	7s 1929	*m*131	124½ 131
Detroit Edison	7s 1930	*m*131	124½ 138½
Dominion Pwr. & Trans	5s 1932	96	95 97
Driver-Harris	8s 1931	97½	95 98½
Dubuque Elec	6s 1942	102½	102 103½
Duke-Price Pwr	6s 1949	107	102 106
Duke Price Pwr	6s 1966	*k*101½	100½ 101½
Duquesne Lt.	6s 1949	106	105½ 107
Duquesne Lt.	5½s 1949	105½	105 106½
Durham Pub. Serv	5s 1949	100½	99 101½
EAST PENN. ELEC	6s 1953	104½	105 106
East. N. J. Pwr	6s 1949	101½	99 101½
East Oregon Lt. & Pwr.	6s 1929	100	100 101
East. Tex. Elec	5s 1942	*k* 97	....
Economy Lt. & Pwr	5s 1956	98½	99 100
Edison Elec. Illum. of Boston (notes)	4½s 1928	99½	99½ 100½
Edison Elec. Illum. of Bklyn	4s 1939	94½	93 99½
Edison El. Illum. (N.Y.)	5s 1995	105½	103 108½
El Paso Elec	5s 1932	*m*102	....
El Paso Elec	5s 1950	98½	95 98
El. Pwr. Corp. (Germany)	6½s 1950	*k* 87½	....
Elec. Refrigeration	6s 1936	102½	100½ 107
Elmira Wtr., Lt. & R.R.	5s 1956	97	96 97½
Empire Dist. Elec	5s 1949	94	92 94½
Erie Ltg	5s 1967	99½	99 100½
Evansville G. & El. Lt	5s 1932	99	99 100
FEDERAL LT. & TRAC	5s 1942	98½	92½ 97½
Federal Lt. & Trac	6s 1942	103	100 104½
Federal Lt. & Trac	6s 1954	94½	93 96
Florida Power & Light	5s 1954	*k* 95	91½ 95
Florida Pub. Service	6s 1955	97	97 99
Florida Public Service	6½s 1949	99½	99 103
Ft. Smith Lt. & Trac	5s 1936	*k* 77	....
Ft. Worth Pwr. & Lt	5s 1931	100½	99 100½
GALVESTON ELEC	5s 1940	87	89 92
General Elec	3½s 1942	88	87 90
Georgia Carolina Pwr	5s 1952	22½	87 92½
Ga. Lt., Pwr. & Rys	5s 1941	87	88 92
Ga. Ry. & Elec	5s 1932	99½	98½ 100½
Ga. Ry. & Elec	5s 1949	95½	94½ 97
Ga. Ry. & Pwr	5s 1954	98	96 99
Ga. Ry. & Pwr	6s 1947	*k*104	....
Ga. Ry. & Pwr	7s 1941	*k*105	....
German Gen. Elec	6½s 1940	*k* 97½	94 99½
German Gen. Elec	7s 1945	98½	95 98½
Great Cons. Elec. Pwr. (Japan)	6½ 1950	*k* 85½	85 86
Great Cons. Elec. Pwr. (Japan)	7s 1944	*k* 92½	....
Great Falls Pwr	5s 1940	103½	101½ 104½
Great Northern Pwr	5s 1935	99½	98½ 100½
Great Western Pwr	5s 1946	*k* 99	....
Great Western Pwr	5½s 1955	100	99 101
Great Western Pwr	6s 1949	102½	102 103½
Great Western Pwr	6s 1952	*k*103½	....
HAMBURG ELEC	7s 1935	*k* 96	94 97½
Havana Elec. R., Lt. & P	5s 1954	94½	92½ 95
Holtwood Pwr	6s 1954	104½	100 104½
Houston Ltg. & Pwr	5s 1931	100	99 101
Houston Ltg. & Pwr	5s 1953	96½	90½ 95½
Houston Ltg. & Pwr	5½s 1954	100½	99½ 102½
Hydraulic Pwr	5s 1951	101½	101½ 102
Hydraulic Pwr	5s 1950	101½	101½ 103
IDAHO PWR	5s 1947	98½	96 98½
Ill. Elec. Pwr	6s 1943	103½	102 103½
Ill. Pwr	5s 1933	*k* 95½	....
Ill. Pwr	6s 1944	*k* 99	....
Ill. Pwr. & Lt	5½s 1954	98½	97½ 99
Ill. Pwr. & Lt	6s 1953	102½	100½ 102½
Ill. Pwr. & Lt	7s 1953	102½	102 103½
Ind. Elec	6s 1947	99	98 100
Ind. Gen. Serv	5s 1948	98½	96½ 98½
Ind. Lighting	4s 1958	83½	82½ 84
Indiana & Mich. Elec	5s 1955	98½	96 98½
Indiana & Mich. Elec	5s 1957	100	97½ 100½
Ind. Service	5s 1950	93½	91½ 93½
Ind. Service	6s 2020	86	83 88½
Ingersoll-Rand	5s 1935	100	....
International Pwr. Sec	6½s 1955	*l* 90½	....
Interstate Elec	6s 1933	96	94 98½
Interstate Pwr	6s 1944	*k* 99	....
Interstate Pwr	7s 1934	*k*100½	....
Interstate Pub. Serv	6s 1948	99½	98 99½
Iowa Ry. & Lt	5s 1932	99	97½ 100
Iowa Southern Utilities	5½s 1950	94	94 96
JERSEY CENT. PWR. & LT	5½s 1945	96½	95 98
KANSAS CITY PWR. & LT	5s 1952	*k*103½	....
Kansas Elec. Pwr	6s 1937	*k*101½	....
Kansas Elec. Pwr	6s 1943	102½	99½ 102½
Kansas Gas & Elec	6s 1952	105½	101½ 106
Kansas Gas & Elec	6s 2022	94	92½ 93½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high. Tuesday, May 18. *l*Bid, low, high, Wednesday, May 19. *m*Latest quotations available. *n*1925.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies		Bid Price Saturday May 15	Low 1926	High 1926
BONDS (Continued)				
Kentucky Hydro Elec....	6s	1949	100¼	99½	101¼
Kentucky Utilities.....	6s	1949	103½	99½	102½
Kings Cty. Elec. L. & P..	6s	1937	103	102	103½
Kings Cty. Elec. L. & P..	6s	1997	123½	120½	123½
Kings County Ltg.....	5s	1954	100½	98½	100½
Kings County Ltg.....	6½s	1954	109	106	110
Knoxville Ry. & Lt.....	5s	1946	97½	95½	98
LACLEDE GAS LT.....	5s	1934	100½	100	101½
Laclede Gas Lt.....	5½s	1953	k100	98	100½
Laurentian Pwr.....	6s	1936	100½	100	101
Laurentide Pwr.....	5s	1946	100½	100	102
Lehigh Pwr. Sec.....	6s	2026	95	93	95½
Lincoln Gas & Elec.....	5s	1941	94½	92½	94½
Long Island Ltg.....	5s	1936	k100½	....	....
Long Island Ltg.....	6s	1954	101½	99½	102
Long Island Ltg.....	6s	1948	107½	104½	108
Los Angeles Gas & Elec..	5s	1939	k100½	....	....
Los Angeles Gas & Elec..	5½s	1943	102	99	102
Los Angeles Gas & Elec..	5½s	1947	k102	....	....
Los Angeles Gas & Elec..	5½s	1949	102	99	102
Los Angeles Gas & Elec..	6s	1942	106½	102½	105½
Louisiana Pwr.....	6s	1944	101	98½	101½
Louisville Gas & Electric.	6s	1937	101	100	102
Louisville Gas & Elec....	5s	1952	k 99½	....	....
Louisville Gas & Elec....	5½s	1954	104	102	104½
Lower Austrian Hydro El.	6½s	1944	83½	82½	87½
Luzerne Cty. Gas & El...	5s	1948	99½	97½	99½
Luzerne Cty. Gas & El...	7s	1944	105	103½	105½
Luzerne Cty. Gas & El...	6s	1954	103½	102	104
MADISON RIV. PWR..	5s	1935	100½	100	101
Manila Elec.....	7s	1942	114½	102	115½
Manila Elec. Ry. & Ltg..	5s	1953	93	89½	94
Manitoba Pwr.....	5½s	1951	k 97½	94½	98
Memphis Pwr. & Lt....	5s	1948	99½	99	100½
Metropolitan Edison....	6s	1952	108	104	108
Metropolitan Edison....	5s	1953	100	96½	101½
Metropolitan Pwr.....	6s	1953	105½	102½	104½
Michigan Lt.....	5s	1946	k 99½	....	....
Michigan No. Pwr.....	5s	1941	99½	97	100
Milwaukee El. Ry. & Lt..	4½s	1931	98½	97	99
Milwaukee El. Ry. & Lt..	5s	1951	99½	98½	100
Milwaukee El. Ry. & Lt..	5s	1961	k 95½	....	....
Milwaukee El. Ry. & Lt..	6s	1953	104½	100½	104½
Minn. Pwr. & Lt.....	5s	1955	97½	95½	97
Minn. Pwr. & Lt.....	6s	1950	105½	104	106
Miss. Power.....	5s	1955	93	92	94
Miss. River Pwr.....	5s	1951	100½	99	100½
Miss River Pwr.....	7s	1935	101½	102	103
Mo. Edison Elec.....	5s	1927	m100½	100½	100½
Mo. Pwr. & Lt.....	5½s	1955	97½	96	98½
Mobile Elec.....	5s	1946	k 98½	....	....
Monongahela W. Pa. Pub. Service.....	5½s	1953	96	95	97½
Montana Pwr.....	5s	1943	k101½	....	....
Montreal Lt., Ht. & Pwr.	4½s	1932	97½	97	98½
Montreal Lt., Ht. & Pwr.	5s	1933	99½	99½	101½
Montreal Pub. Serv.....	5s	1942	94½	94	95½
Mountain States Pwr.....	6s	1938	100	98½	101
Municipal Service.....	5s	1942	93½	92½	93½
NASHVILLE RY. & LT.	5s	1953	98½	96½	98½
Nashville Ry. & Lt.....	5s	1958	92½	90½	93
Nassau Lt. & Pwr.....	5s	1927	99½	98½	100½
Nassau & Suffolk Ltg....	5s	1945	92½	89½	93
National Elec. Power....	6s	1945	92½	92½	94
National Pwr. & Lt.....	7s	1972	k101½	....	....
National Pub. Serv.....	6½s	1955	95½	94½	97
Nebraska Pwr.....	5s	1949	100½	99	101½
Nebraska Pwr.....	6s	2022	97½	94½	98
Nevada-Calif. Elec.....	6s	1946	k102	....	....
Nevada-Calif. Elec.....	6s	1950	101	98½	101½
New Brunswick Pwr.....	5s	1937	84	81½	85½
New England Pwr.....	5s	1951	103½	100½	104½
New Jersey Pwr. & Lt....	5s	1936	99	96½	99
New Orleans Pub. Serv...	4½s	1935	89½	87	89½
New Orleans Pub.Serv..A.	5s	1952	k 96	....	....
New Orleans Pub. Serv...	5s	1955	95½	90½	96½
New Orleans Pub. Serv...	6s	1949	92½	90	92½
N.Y. & Queens El. L.&P..	5s	1930	103	100½	103½
N.Y. & Westchester Ltg..	4s	2004	81½	79½	81½
N.Y. & Westchester Ltg..	5s	1954	98½	97½	98½
New York Edison.....	6½s	1941	k117	....	....
New York Edison.....	5s	1944	k104½	....	....
N.Y. Gas & El. L., H.&P.	5s	1948	105½	104	105½
N.Y. Gas & El. L., H.&P.	4s	1949	91	89½	91½
N.Y. State Gas & Elec...	5½s	1962	101	100	101
Newport News & Hampton Ry., Gas & Elec...	5s	1944	90	89½	91
Niagara Falls Pwr.....	5s	1932	102½	100½	103
Niagara Falls Pwr.....	6s	1932	105	104½	106½
Niagara Falls Pwr.....	6s	1950	106½	105	107
Niagara, Lock. & Ont. Pwr.	5s	1955	k100½	....	....
Niagara, Lock. & Ont. Pwr.	6s	1958	m106	....	....
Norfolk Ry. & Lt.....	5s	1949	95½	94	96½
No. Amer. Edison.....	6s	1952	104	101½	105
No. Amer. Edison.....	6½s	1948	105½	103½	106
No. Amer. Lt. & Pwr....	7s	1954	98½	99	100½
North Caro. Pub. Serv...	5s	1934	k 94½	....	....
North Caro. Pub. Serv...	6s	1954	96	94½	97
North Caro. Pub. Serv...	6½s	1944	99	98	100½
North Shore Elec.....	5s	1940	100½	98½	101
No. Calif. Pwr.....	5s	1948	100½	99½	101½
No. Ind. Gas & Elec.....	5s	1929	99½	99	100
No. Ind. Gas & Elec.....	6s	1952	104½	102½	105
Northern N. Y. Utilities..	5s	1955	97½	95	98
Northern N. Y. Utilities..	5½s	1949	100½	100	101½
No. Ohio Pwr.....	7s	1935	k 93½	....	....
No. Ohio Trac. & Lt.....	4s	1933	90	87	91
No. Ohio Trac. & Lt.....	5s	1956	84	84	86
No. Ohio Trac. & Lt.....	6s	1926	99½	99	100
No. Ohio Trac. & Lt.....	6s	1947	95½	92½	96½
No. States Pwr.....	6½s	1933	k110	108	132
No. States Pwr. (notes)....	6½s	1933	k103½	102½	104
No. States Pwr.....	6s	1948	k103½	....	....
No. States Pwr.....	6s	1941	k106	....	....
No. States Pwr.....	5s	1941	k 99½	....	....
No. Tex. Elec.....	5s	1940	68	72	75
Northwestern Elec.....	6s	1935	102½	102	103½
Northwestern Pub. Serv..	6½s	1948	101½	99½	102½
Nova Scotia Tr. & Pwr...	5s	1946	88	88	90
OHIO PWR.....	5s	1952	k 97½	94	98½
Ohio Pwr.....	6s	1953	105	103½	104½
Ohio Pwr.....	6s	2024	98½	95½	98½
Ohio Pwr.....	7s	1951	106	105½	106½
Ohio Pub. Serv.....	5s	1954	96	92½	96½
Ohio Pub-Serv.....	6s	1953	102½	101	102½
Ohio Pub. Serv.....	7½s	1946	113	112½	113½
Ohio Pub. Serv.....	7s	1947	112½	110½	112½
Ohio River Edison.....	6s	1948	k103½	....	....
Okla. Gas & Elec.....	5s	1950	94½	93	94½
Okla. Gas & Elec.....	6s	1940	k 96	....	....
Ontario Pwr. of Niagara Falls.....	5s	1943	k100	....	....
Ontario Transmission....	5s	1945	100½	99½	101
Ozark Pwr. & Wtr.....	5s	1952	84	77	84
PACIFIC COAST PWR..	5s	1940	99½	99	100½
Pacific Gas & Elec.....	5s	1942	k100	....	....
Pacific Gas & Elec.....	5½s	1952	k104½	101½	104½
Pacific Gas & Elec.....	6s	1941	k108	....	....
Pacific Lt. & Pwr.....	5s	1942	k101½	....	....
Pacific Lt. & Pwr.....	5s	1951	100½	100	101½
Pacific Pwr. & Lt.....	5s	1930	100	99½	101
Pacific Pwr. & Lt.....	5s	1953	m 96½	....	....
Parr Shoals Pwr.....	5s	1952	97	95	98½
Paterson & Passaic G.&E.	5s	1949	102½	100	101½
Penn Central Lt. & Pwr...	5½s	1975	96	94½	97
Penn Central Lt. & Pwr...	6s	1953	104	102½	105
Penn Edison.....	5s	1946	98½	96½	98½
Penn. Elec.....	6s	1955	m105	92	105
Penn Elec.....	6½s	1954	m105	97	100½
Penn.-Ohio Edison.....	6s	1950	k102	98½	106
Penn Ohio Elec.....	6½s	1938	105½	105	107
Penn Ohio Pwr. & Lt.....	5½s	1954	100½	98½	100½
Penn Ohio Pwr. & Lt.....	6s	1939	98	97	98½
Penn Pwr. & Lt.....	5s	1952	99½	97½	99½
Penn Pwr. & Lt.....	5s	1953	99½	97½	99½
Penn Pwr. & Lt.....	6s	1953	105	105	106
Penn Pwr. & Lt.....	7s	1951	106	105½	106½
Penn Pub. Serv.....	5s	1954	97½	96	98½
Penn Pub. Serv.....	6s	1947	104½	103	105
Penn Wtr. & Pwr.....	5s	1940	101½	101½	102½
Penn Wtr. & Pwr.....	5½s	1953	103½	102½	103½
Phila. Co.....	6s	1944	k105	....	....
Phila. Co.....	5½s	1938	k100½	....	....
Phila. Co.....	5s	1951	98	97½	99½
Phila. Co.....	5s	1949	m104½	103½	104½
Phila. Elec.....	5s	1966	c103½	102	104½
Phila. Elec.....	4s	1966	m 87	84	87
Phila. Elec.....	5s	1960	c103½	102	103½
Phila. Elec.....	6s	1941	c107½	107½	108½
Phila. Elec.....	5½s	1947	k107½	106½	107½
Phila. Elec.....	5½s	1953	c107½	103½	107½
Phila. Elec. Pwr.....	5½s	1972	c102½	100½	102½
Portland Elec. Pwr.....	6s	1947	101½	99	102½
Portland Gen. Elec.....	5s	1935	102	99½	102½
Portland Ry., Lt. & Pwr..	5s	1942	91½	88½	94½
Portland Ry., Lt. & Pwr..	6s	1947	100½	99	102½
Portland Ry., Lt. & Pwr..	7½s	1946	106	105½	108½
Potomac Edison.....	6s	1949	100	99	100½
Potomac Edison.....	6½s	1948	103½	103	104
Potomac Elec. Pwr.....	5s	1929	j100½	....	....
Potomac Elec. Pwr.....	5s	1936	j100½	....	....
Potomac Elec. Pwr.....	6s	1953	j106	....	....
Potomac Elec. Pwr.....	7s	1941	j106½	....	....
Power Corp. of N. Y.....	6s	1942	100½	101	101½
Power Corp. of N. Y.....	6½s	1942	105	104	105½
Power Securities.....	6s	1949	k 79	....	....
Pub. Lt. & Pwr.....	5s	1945	67	68	73
Pub. Serv. Co. of Colo....	5½s	1954	96½	95	96½
Pub. Serv. Co. of Colo....	6s	1953	100½	100	101½
Pub. Serv. Co. of Colo....	7s	1933	101½	101½	102½
Pub. Serv. Corp. of N.J....	5s	1959	m101	104½	105
Pub. Serv. Corp. of N.J....	6s	1944	k103½	....	....
Pub. Serv. Co. of No. Ill..	5s	1956	99	98	99½
Pub. Serv. Co. of No. Ill..	5½s	1962	104½	103½	105
Pub. Serv. Co. of No. Ill..	5½s	1964	104½	103½	105½
Pub. Serv. Co. of Okla...	6s	1949	102½	98½	102½
Pub. Serv. Elec. & Gas...	5½s	1959	k105	....	....
Pub. Serv. Elec. & Gas ...	5½s	1964	k105	....	....
Pub. Util. Evansville, (Ind.)	6s	1938	k100½	....	....
Puget Sound Pwr.....	5s	1933	100½	99	101½
Puget Sound Pwr. & Lt...	5½s	1949	k101	....	....
QUEBEC PWR.....	6s	1953	103½	101½	104
Queensborough Gas & E..	5s	1952	100	99½	100½
Queensborough Gas & E..	6s	1953	105	104	105½
Quincy (Ill.) Gas, Elec. and Heat.....	5s	1935	94	93	94½
RHINE-WESTPHALIA ELECTRIC PWR.....	7s	1950	k 95½	93½	96
Rio de Janeiro Tram., Lt. & Pwr.....	5s	1935	94	93	94½
Robbins & Myers.....	7s	1952	60	58	68½
Rochester Gas & Elec....	5½s	1948	105½	104½	106
Rochester Gas & Elec....	7s	1946	k112½	....	....
Rochester Ry. & Lt.....	5s	1954	101	100½	101½
Rockford Elec.....	5s	1939	100½	99½	100½
Rome Wire.....	6s	1940	98½	98	100½
ST. MAURICE PWR...	6½s	1953	108	108	109½
St. Paul Gas Lt.....	5s	1944	101	100½	101½
St. Paul Gas Lt.....	5½s	1954	101½	101	102½
St. Joseph Ry., Lt., H.&P.	5s	1937	94½	91½	97
Salt River Valley Wtr....	6s	1938	k100	....	....
Salmon River Pwr.....	5s	1952	100½	100½	101½
San Antonio Gas & Elec..	5s	1949	96½	96	97½
San Antonio Pub. Serv...	6s	1952	104½	101½	104
San Diego Cons. G.& E....	5s	1930	k100½	....	....
San Diego Cons.G.&E....	6s	1939	102½	101	102½
San Joaquin Lt. & Pwr...	5s	1945	100	98½	100
San Joaquin Lt. & Pwr...	6s	1950	104	103	104½
San Joaquin Lt. & Pwr...	6s	1952	104	99½	104
San Joaquin Lt. & Pwr...	6s	1954	103½	100½	103½
Sauda Falls.....	5s	1955	k 96	93	96
Savannah Elec. & Pwr....	7½s	1941	k106½	....	....
Saxon Pub. Wks. (Germany).....	7s	1945	k 95	....	....
Scranton Electric.....	5s	1937	101½	101½	102½
Seattle Elec.....	5s	1930	100½	100½	101½
Seattle Elec.....	5s	1929	99½	99½	100½
Seattle Elec.....	5s	1939	93½	92½	94½
Seattle Ltg.....	5s	1949	93½	90½	94
Servel Corp.....	6s	1931	k102	99½	104½
Shawinigan Wtr. & Pwr..	5s	1934	100½	100	101½
Shawinigan Wtr. & Pwr..	5½s	1950	104½	103½	105
Shawinigan Wtr. & Pwr..	6s	1950	104½	104½	105½
Sheboygan Elec.....	5s	1946	97½	94½	98
Siemens & Halske.....	7s	1928	k 99	96	100
Siemens & Halske.....	7s	1935	k 96½	93	98
Sierra & San Fran. Pwr...	5s	1949	k 76	....	....
Sierra & San Fran. Pwr....	6s	1949	k 90	....	....
Sioux City Gas & Elec....	6s	1947	102½	101½	103½
Sioux City Gas & Elec....	6s	1949	102½	102	103½
So. Caro. Gas & Elec.....	6s	1942	92½	78	97
So. Caro. Gas & Elec.....	6s	1932	80	70	82
Southeast Pwr. & Lt.....	6s	2025	k 94½	89	94½
So. Cal. Edison.....	5s	1939	k101	....	....
So. Cal. Edison.....	5s	1944	99½	98	99½
So. Cal. Edison.....	5½s	1944	104½	103	105
So. Cal. Edison.....	6s	1943	104½	102	104
So. Cal. Edison.....	6s	1944	k105½	....	....
So. Cities Utilities.....	8s	1931	m 99	99	102
Southern Colo. Power....	6s	1947	99	97½	99½
So. Ind. Gas & Elec.....	6s	1947	k 99½	....	....
Southern Pwr.....	5s	1930	100½	100	101
So. Public Utilities.....	5s	1943	100½	100	101½
So. Sierras Pwr.....	6s	1936	k105	....	....
So. Wisconsin Pwr.....	5s	1938	92½	91	93
Southwestern Gas & E....	5s	1932	97½	97	98½
Southwestern Gas & E....	6s	1957	98	97½	99½
Southwestern Lt. & Pwr..	6s	1937	98	98	99½
Southwestern Power.....	6s	1944	96½	96½	98
Southwestern Pwr. & Lt..	5s	1943	96	94	96½
Southwestern Pwr. & Lt..	6s	2022	95½	94	96½
Southwestern Pub. Serv..	6s	1945	94	94	96
Southwestern Utilities....	8s	1936	109	92½	96
Springfield Lt., Ht. & Pwr.	5s	1933	98½	99	100½
Standard Elec. of Cal....	5s	1939	100	99½	101
Standard Gas & Elec.....	6s	1935	k100½	....	....
Staten Island Edison.....	6½s	1953	105½	106	107½
Superior Water, Lt. & Pwr.	4s	1931	94½	94½	95½
Syracuse Ltg.....	5s	1951	102½	100	101½
Syracuse Ltg.....	5½s	1954	104½	103½	104½
TAMPA ELEC.....	5s	1933	k 99	....	....
Tenn. Elec. Pwr.....	6s	1947	k105½	....	....
Tenn. Pwr.....	5s	1962	96½	96	97
Tex. Pwr. & Lt.....	5s	1937	99½	98½	100
Tex. Pwr. & Lt.....	6s	2022	98	98	99½
Tide Water Pwr.....	6s	1942	101½	100	101½
Tide Water Pwr.....	7s	1937	103	100	107
Toho Elec. Pwr. (Japan).	7s	1955	k 92½	....	....
Tokyo Elec. (Japan).....	6s	1928	k 98½	....	....
Toledo Edison.....	5s	1947	100½	100	100½
Toledo Edison.....	7s	1941	k108½	....	....
Toledo Gas, Elec. & Htg.	5s	1935	100½	98	100½
Toledo Tr., L.&P. (notes)	5½s	1930	98	98	99½
Topeka Edison.....	5s	1930	99	99	100
Topeka Ry. & Lt.....	5s	1933	94½	94½	96½
Trenton Gas & Elec.....	5s	1949	102½	100½	102½
Tri-City Ry. & Lt.....	5s	1930	k 98½	....	....
Twin State Gas & Elec...	5s	1953	96½	95	96½
Twin State Gas & Elec...	5½s	1945	100	98	100½
Tyrol Hydro-Elec. Pwr...	7½s	1955	96	95½	97½
UJIGAWA ELEC PWR.	7s	1945	92	92	94
Union Elec. Lt. & Pwr...	5s	1932	101½	100½	102½
Union Elec. Lt. & Pwr...	5s	1933	100½	100½	101½
Union Elec. Lt. & Pwr...	5s	1954	100	99½	101
Union Elec. Lt. & Pwr...	5½s	1954	k101½	....	....
United Elec. of N.J.....	4s	1949	88½	87½	89
United Elec. Lt. & Pwr...	4½s	1929	98	98	99½
United Lt. & Pwr. (notes)	5½s	1928	99½	99	100½
United Lt. & Pwr.....	5½s	1959	96	96	97½
United Lt. & Pwr.....	6½s	1974	97	95½	98½
United Lt. & Rys.....	5s	1932	k 96½	....	....
United Lt. & Rys.....	6s	1926	99½	100	101½
United Lt. & Rys.....	6s	1952	100½	99	101½
United Lt. & Rys.....	6s	1973	90	89½	92
United Pwr. & Lt.....	6s	1944	102	102	103½
United Water, G. & E....	5s	1941	95½	94	95
Utah Lt. & Trac.....	5s	1944	k 92½	....	....
Utah Pwr. & Lt.....	5s	1944	k 98½	....	....
Utah Pwr. & Lt.....	6s	1944	103	102½	104½
Utah Pwr. & Lt.....	6s	2022	94½	88½	95
Utica Elec. Lt. & Pwr....	5s	1950	102½	100½	102½
Utica Gas & Elec.....	5s	1957	101½	100½	102½
Utica Gas & Elec.....	5½s	1949	104½	103½	104½
VERMONT HYDRO-ELEC.....	6s	1929	100	100	101
Vicksburg Lt. & Trac....	5s	1932	95	93½	95½
Virginian Pwr.....	5s	1942	99	88	99
Virginian Pwr.....	6½s	1954	m103½	103	104½
Virginia Ry. & Pwr.....	5s	1943	k 98½	....	....
Virginia-Western Pwr....	6s	1953	105	101½	106½
WAGNER EL. MFG...	7s	....	m100½	100	101½
Washington Coast Util....	6s	1941	102½	102½	103½
Washington Ry. & Elec...	4s	1951	f 81½	....	....
Washington Ry. & Elec...	6s	1933	f103	....	....
Washington Wtr. Pwr....	5s	1939	102½	101½	102½
West Penn Pwr.....	5s	1963	102	99½	102½
West Penn Pwr.....	5s	1946	k102½	....	....
West Penn Pwr.....	5½s	1953	k105½	....	....
West Penn Pwr.....	7s	1946	105½	105	108½
W. Va. Lt., Ht. & Pwr...	6s	1929	101½	101	102½
West Virginia Utilities....	6s	1935	98½	95½	99
W. Va. Water & Elec....	6½s	1942	m103½	102½	104
Westchester Ltg.....	5s	1950	102½	102	103½
Western Elec.....	5s	1944	k102½	....	....
Western N. Y. Utilities...	5s	1946	97½	96½	98
Western Pwr.....	6½s	1954	100½	100	102
Western Power of Canada	5s	1949	94½	94	95½
Western Pub. Service....	6s	1950	98½	98	99½
West States Gas & Elec..	5s	1941	100	98½	100½
West States G.&E. (notes)	6s	1937	94½	94½	96
West States Gas & Elec..	6s	1947	k100	....	....
West United Gas & El....	5s	1950	k102	101½	102½
Westphalia Un. Elec. Pwr	6½s	1950	k 85	84½	87½
Westinghouse El. & Mfg.	7s	1931	k105½	....	....
Wheeling Elec.....	5s	1941	99	99	100
Wichita R. R. & Lt.....	5s	1932	84½	83	88
Winnipeg Elec.....	6s	1954	96½	96	97½
Wisconsin Elec. Pwr....	5s	1954	99½	98½	100
Wisconsin Gas & Elec....	5s	1952	k 99½	....	....
Wis.-Minn. Lt. & Pwr....	5s.	1944	k 97	....	....
Wisconsin Pwr., Lt. & Ht	5s	1946	93½	92	94½
Wisconsin Pub. Service...	6s	1952	101½	101	102½
Wis. Ry., Lt. & Pwr.....	5s	1933	95½	94½	96½
Wis. River Pwr.....	5s	1941	94	92½	94
Wolverine Pwr.....	7s	1943	101½	100	101½
YADKIN RIVER PR..	5s	1941	k100½	....	....
Yarmouth Lt. & Pwr.....	5s	1937	84	83	85
Yarmouth Lt & Pwr.....	8s	1951	102	99	103

Stock Exchange: cChicago; dSt. Louis; ePhiladelphia; fBoston; gBaltimore; hMontreal; iCincinnati; kSan Francisco; lPittsburgh; mWashington. &Bid, low, high, Tuesday, May 18. †Bid, low, high, Wednesday, May 19. mLatest quotations available. m1925.

Manufacturing and Markets

Fire Protection Association Adopts New Wiring Rules

Action of Electrical Committee in Approving Minority Report of Article 5 Committee Overwhelmingly Sustained

ACCEPTANCE by the electrical committee of the minority report of the committee on Article 5, for regulation of the use of non-metallic sheathed cable, was approved by the National Fire Protection Association at its meeting held at Atlantic City, N. J., on May 13. At the meeting of the electrical committee held in New York on Feb. 18 and 19 last W. H. Blood's proposed rules for non-metallic sheathed cable were approved with slight changes. The report of the action taken by the electrical committee as well as the rules for non-metallic sheathed cable that were approved appeared in the Feb. 27 issue of the ELECTRICAL WORLD.

At the meeting of the Fire Protection Association Howard Sargent, representing the sentiment of the supply manufacturers who have been opposing the admission of this new material to the code, spoke against the resolution, and letters from W. S. Boyd and Victor Tousley were read. These letters expressed disfavor on the part of the Western Association of Electrical Inspectors and the Chicago city department. A. M. Shane and J. C. Forsythe, speaking for the Southeastern section and the Eastern Inspectors' Association, urged the approval of the Fire Protection Association. Lawrence W. Davis of the Association of Electragists International favored a suggested compromise which would limit the application of this material to buildings used for residence purposes only.

Dana Pierce made an eloquent appeal for the support of the electrical committee's decision. This appeal was indorsed by Secretary Wentworth of the Fire Protection Association. The Association voted overwhelmingly to sustain the committee, and the rules were approved. This action brings to a close a controversy that has existed for more than three years.

Delinquent Electrical Accounts

(Data Supplied by National Electrical Credit Association)

NUMBER OF ACCOUNTS REPORTED

Division	April 1925	April 1926	Per Cent Increase or Decrease	Four Months 1925	Four Months 1926	Per Cent Increase or Decrease
New York	554	474	—14.4	1,658	1,566	—05.5
Middle and Southern Atlantic States	298	237	—20.4	937	803	—14.3
New England	118	88	—25.4	320	365	+14
Pacific Coast	19	47	+147	71	124	+74.6
Central	964	1,035	+ 7.4	3,565	3,811	+ 6.9
Total	1,953	1,881	— 3.7	6,551	6,669	+ 1.8

TOTAL AMOUNTS REPORTED

Division	April 1925	April 1926	Per Cent Increase or Decrease	Four Months 1925	Four Months 1926	Per Cent Increase or Decrease
New York	$66,989	$72,009	+07.5	$257,440	$233,075	—09.5
Middle and Southern Atlantic States	30,265	26,621	—12	132,015	78,710	—40.4
New England	10,466	8,023	—23.3	32,160	34,602	+ 7.5
Pacific Coast	1,570	11,940	+660	12,452	23,821	+91.3
Central	107,660	131,025	+21.7	436,670	398,735	— 8.7
Total	$216,950	$249,618	+15	$870,737	$768,943	—11.7

AVERAGE AMOUNTS

Division	April 1925	April 1926	Four Months 1925	Four Months 1926
New York	$120	$152	$155	$148
Middle and Southern Atlantic States	101	112	141	98
New England	88	91	100	94
Pacific Coast	82	254	175	192
Central	111	126	122	105

Contracts to Date Higher than in 1925

Construction Jobs Already Let and Projected Work Shows Gain Despite Increased Cost of Labor in Several Important Industrial Centers

ENGINEERING construction contracts let in the entire United States during April amounted to $280,046,000, which compares with $254,149,000 during the same month last year. The increased cost of labor in several of the most important industrial centers throughout the country evidently had little effect upon contract letting. The accompanying table gives the value of contracts let in the United States and Canada and includes waterworks and excavating projects valued at $15,000 or over; other public works, $25,000 and up; industrial buildings at a minimum of $40,000, and commercial and other buildings, $150,000 and higher. The construction volume index number is 233 for the month of April and 201 for the whole of 1925, as against 100 for 1913. This means that the actual volume of construction in 1925 (not the mere money value of the contracts let that year) is 101 per cent above the volume of construction for 1913. This index number indicates the rate at which contracts are being let as compared with 1913 awards.

A total of $881,045,000 worth of engineering contracts was let between Jan. 1 and May 1 this year. Buildings represented $600,469,000 of this and other

VALUE OF CONTRACTS LET IN THE UNITED STATES AND CANADA, APRIL, 1926

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States	Jan. 1 to Date U. S.	Canada
Waterworks	$147,000	$1,098,000	$1,539,000	$1,192,000	$1,166,000	$2,286,000	$7,428,000	$22,836,000	$131,000
Sewers	.....	1,167,000	330,000	2,448,000	2,154,000	1,127,000	7,226,000	26,028,000	670,000
Bridges	41,000	2,333,000	792,000	1,164,000	1,442,000	429,000	6,201,000	29,442,000	.....
Excavation, drainage, irrigation	.....	130,000	685,000	94,000	23,000	838,000	1,770,000	8,288,000	.....
Streets and roads	712,000	10,117,000	10,239,000	10,659,000	14,352,000	4,125,000	50,204,000	112,653,000	1,657,000
Industrial buildings	8,301,000	2,863,000	1,852,000	4,143,000	4,356,000	5,575,000	27,090,000	134,506,000	2,190,000
Commercial buildings	17,661,000	53,469,000	5,942,000	43,293,000	17,372,000	18,863,000	156,600,000	465,963,000	9,822,000
Federal government	30,000	177,000	2,827,000	583,000	93,000	2,059,000	5,769,000	16,180,000	.....
Unclassified	579,000	1,822,000	539,000	2,773,000	7,211,000	4,834,000	17,758,000	74,149,000	2,214,000
April, 1926	$27,471,000	$73,176,000	$24,745,000	$66,349,000	$48,169,000	$40,136,000	$280,046,000	$881,045,000	$16,684,000
March, 1926	11,983,000	99,556,000	25,140,000	46,524,000	24,565,000	22,552,000	230,320,000	.....	10,818,000
April, 1925	18,954,000	85,627,000	14,728,000	64,971,000	38,590,000	31,279,000	254,149,000	.....	10,934,000
Jan. 1 to date, 1926	56,283,000	307,146,000	107,193,000	191,232,000	118,808,000	100,383,000	881,045,000	.....	39,638,000
Jan. 1 to date, 1925	62,730,000	253,587,000	59,469,000	133,662,000	126,767,000	99,358,000	735,573,000	.....	19,877,000

construction $280,576,000. This is compared with $735,573,000 for the corresponding period last year. Of this total, buildings accounted for $457,354,000 and other construction for $278,219,000. The gain in buildings amounted to 31 per cent and that of other construction to 1 per cent.

Further evidence that the peak of the building boom has not been reached and passed is found in a comparison of totals for proposed work, definitely reported as such, for the period Jan. 1 to May 1 this year and last. The total for the first four months of 1926 was $2,191,156,000 in engineering projects reported as proposed. Of this, $1,260,761,000 was for buildings and $930,395,000 for other work. During the corresponding period last year the total was $1,809,343,000, buildings amounting to $1,027,963,000 and construction other than buildings to $781,380,000.

Projects definitely reported as proposed offer a better index of construction activity than building permits alone. Proposed work in April totaled $537,385,000, against $392,400,000 for the same month last year. Proposed construction other than buildings was 83 per cent greater in April than for the same month last year, while buildings were 15 per cent ahead.

Past experiences lend strength to the belief that considerably more than 75 per cent of these projects will mature as contracts before Aug. 1, 1926. Present gains in projected work are almost sure to be reflected in similar increases in the contract volume three months hence, compared with the corresponding period in the peak year 1925.

Duty on Copper Not an Immediate Possibility

Renewed agitation of the copper duty proposal by Senator Cameron of Arizona and Representative James of Michigan has created the impression that action on such legislation is imminent, but this is not the case. Those favoring this duty realize that they must muster additional support for the plan before they can hope to put it through. For that reason they expect to be active in acquainting the public with the arguments which they are advancing. The inquiries which are reaching Washington show that the interest in this matter is not confined to the United States, for at least one foreign government has asked for information. The reaction from the electrical industry is that there is more concern over getting the duty off aluminum than there is over the possibility of a duty on copper. Were a duty imposed on copper, substitution of other metals would be hastened, it is declared.

Business Conditions

OUTSTANDING among the opinions of manufacturers in the industry are two things, first, that steady sales are expected throughout the year, and second, that April business when examined has shown a surprisingly good total as the aggregate result of many small orders, there being virtually no spectacular business. Appliance manufacturers all report a good increase in the demand, which is believed to be due to the attitude of the public in grasping the labor-saving idea of all appliances and thus becoming more susceptible to sales arguments. Manufacturers of switching equipment and transformers report total sales good and many inquiries outstanding but few orders placed this week.

In New England power equipment sales have again dominated the market. There are no outstanding orders, but the volume of sales of a prominent manufacturer is reported as the largest recorded this year. An order from a rapid-transit company for substation equipment amounted to about $100,000. Industrial buying has shown a tendency toward improvement in the New York district, many inquiries from central-station companies are outstanding, and a million-dollar order for railroad substation equipment is expected to be placed soon. In the Southeast line material continues in especially strong demand so that deliveries on poles are being delayed. The general volume of business is reported as very satisfactory. Slight hesitation in buying has been noted in the St. Louis district. An order for $160,000 worth of switching equipment was placed by a central-station company, and business from such sources is holding above normal in that territory. Orders for more than $1,000,000 were placed by a central-station company in the Middle West, mainly for boiler equipment, but the volume of industrial sales fell off somewhat. On the Pacific Coast, although fundamental conditions are sound, buying is cautious. Power companies have placed several orders for line construction material.

Non-Ferrous Metal Market Quiet —Little Change in Prices

Copper buying has slowed up considerably since last week, and the market generally has been quiet, with prices approximately unchanged. Last week Wednesday proved the biggest day for months in point of copper sales, and Thursday also shared in the activity, practically all of the business being placed at 13¾ cents delivered in the East and 14 cents in the Middle West. Since then there has been a marked reduction in inquiries, though one 2,000-ton order from a telegraph company on Monday reflected some interest. With the comparative dullness of the last few days, two or three sellers have shaded prices a little on attractive orders. However, most sellers are firm at 13¾ cents, with one quoting 14 cents nominally.

NEW YORK METAL MARKET PRICES

	May 12, 1926 Cents per Pound	May 19, 1926 Cents per Pound
Copper, electrolytic	13.90	13¾
Lead, Am. S. & R. price	7¼	7¼
Antimony	12¼	12¼
Nickel, ingot	35	35
Zinc, spot	7.125	7.225
Tin, Straits	63½	61¼
Aluminum, 99 per cent	28	28

Base copper price May 19, 1926, 16½ cents

A volume of business well up to the average and uniform prices on the part of both producers and dealers have characterized the lead market. Virtually all the business in New York has been done at 7¼ cents per pound, which continues to be the official contract price of the American Smelting & Refining Company. Galvanizers have shown little interest in the zinc market, and sales have been only moderate. Though there are no large supplies of spot Straits, the tin position is noticeably easier.

Power Equipment Sales Lead in New England District

The settlement of many new construction plans and the rapid progress in construction of plants have compelled attention of companies and corporations to the purchasing of power equipment. During the past week this type of electrical product has again dominated the market in this territory. A prominent manufacturer reports sales in the past week to show one of the greatest volumes recorded this year. With no particularly outstanding order, the total reached very encouraging figures, with transformer inquiries strong, watt-hour-meter sales steady and voltage-regulator sales most active.

Small-motor sales continue to show a favorable trend, and switches and control equipment are attracting much interest. An order for substation switch and control appliances amounting to about $100,000 was received from a rapid-transit company during the week, and a southeastern Massachusetts electric company will soon purchase outdoor switch and control apparatus for station additions. A Vermont power company has very recently called for quotations for a new project, consisting of line material, insulators and control appliances and in addition a number of state institutions will shortly purchase similar electrical equipment. Much interest is reported in larger power units, particularly in turbo-generators. A large engineering corporation reports plans for extensions to a large Southern power plant, in which proposals for a 15,000-kw. turbo-generator and auxiliaries are of interest. Jobbers say sales are spotty, with appliances such as cleaners, refrigerators and washers in most demand.

Industrial Buying Improves in New York District

Industrial buying in the New York district is showing a tendency toward improvement. The demand for motors, of the smaller sizes particularly, is steadily increasing, one manufacturer reporting that his sales for this month are considerably ahead of the April mark.

The larger-sized motors, on the other hand, continue inactive. Manufacturers of control apparatus also report an improvement in conditions, although with them also it is confined to the smaller sizes of equipment. Public utility companies have placed fewer orders during the past few days, al-

though several inquiries are outstanding, and it is expected that the demand for line hardware and switching equipment will show an improvement soon. It is reported that one of the railroads in this district will soon place orders for substation equipment aggregating considerably over a million dollars. Jobbers' sales are considerably below normal, although a slight improvement is apparent.

Line Material in Strong Demand in the Southeast

A sustained volume of very satisfactory business is reported by all electrical interests in the Southeast, a large number of orders which have been in prospect for some time having materialized. The letting of several large contracts in Atlanta resulted in good orders for wiring supplies. Orders for synchronous motors for ice plants continue to increase, and indications are for a banner year in this line, while orders for smaller motor equipment are being received from the territory generally. Intensive sales efforts on electric trucks are reflected in the purchase last week of ten additional electric trucks by a large concern in Birmingham, and several of the larger power companies are making inquiries for trucks for their own use.

Orders for pole-line materials continue to be very heavy and the demand for poles is causing delays in shipments of the creosoted pine variety, which are now quoted on an eight to eleven weeks' delivery basis. Deliveries of insulators, cross-arms and hardware, however, are reported satisfactory despite the strong demand, but shipments on certain sizes of steel-cored aluminum conductor are lengthening materially. Prospects are that the demand for pole-line materials will continue strong throughout the summer months. During the past few weeks one company alone has purchased 4,000 poles, 200 miles of aluminum strand, twelve 38,000-volt transformers and three 66,000-volt transformers. "White way" equipment sales continue satisfactory, one order having been received last week for 600 fixtures for Florida delivery, and other business is in prospect from Alabama and Georgia towns.

Slight Hesitation in Buying Noted in St. Louis District

A few weak spots have appeared in the electrical market in the St. Louis district. Some of the buyers seem to be holding off, expecting reduction in prices this fall on account of the recent drop of 50 cents per ton in pig iron. Central-station business is holding above normal. The switching equipment for the 50,000-kw. turbo-generator unit recently ordered has just been bought for approximately $160,000. There is a good demand for transformers, meters, panelboards, lamps anl heating appliances, especially ranges. Sale of fans has been good, but a little behind last year, on account of the late spring. Factories making medium-sized motors are working overtime. Orders for rubber-covered and weatherproof wire are reported off, but one factory making high-tension cable is working full force and has capacity orders for months ahead. Business in radio apparatus is very quiet, but a good demand for dry batteries, tubes and battery chargers continues. The particularly active spot in radio sales has been in loud speakers. As a whole, the electric business in this district for the past week has been somewhat below that of last year.

Cautious Buying on Pacific Coast —Conditions Good

Business on the Pacific Coast is marked by sound fundamental conditions such as good credit, crops and building activity, but they are accompanied by a spirit of caution and in some cases even pessimism. Building construction has slackened and probably will remain at a low rate owing to unsettled labor conditions. Business from dealers and contractors is brisk, but quantity orders are small. Power company buying is marked by large purchases, including six carloads of crossarms, two carloads of clay conduit, two carloads of 40-ft. and 45-ft. poles, one carload of locust pins and one carload of glass insulators. Railway business is also good. Machinery orders are marked by a gradual decline in purchases of small transformers, and pumping-motor sales are expected to be good for another month at least. Several five-lot to fifteen-lot orders of 75-kva. to 100-kva. 11,000-volt transformers are reported; also five motors of 35 hp. each for an oil plant, one 150-hp. motor for a railway pumping plant and a similar motor for a lumber company. Manufacturers generally report a dull week in sales of power apparatus.

Sales of motors and accessories, transmission wire and schedule materials were maintained in the northern section, although inquiries for large apparatus dropped off perceptibly. The sale of 22 motors ranging from 25 hp. to 150 hp. was made to a sawmill company, and complete equipment was sold to a shingle mill. Cold-storage plants preparing for the fruit season have been purchasing material for extension to the present plants. The city of Tacoma has awarded a contract for about $10,000 worth of fiber conduit and the city of Seattle a contract for $35,000 worth of weatherproof wire. About 500 applications were received by the Supervisor of Hydraulics in the State of Washington for water-power rights during the past eleven months.

Large Orders Placed in Middle West

The volume of business transacted in the Middle West fell off a trifle from that of last week but is considered good. Industrial activity continues and there is plenty of good business to be obtained, although somewhat harder to get. Building activity is threatened with labor difficulties which are viewed with growing concern. The various utility companies are active, and a large amount of construction work is under way and contemplated. There has been a rather good demand for apparatus this week, the following items being purchased: Six water-tube boilers complete with superheaters, economizers, etc., valued at over $1,000,000; two 30-in. motor-driven 30,000-g.p.m. centrifugal pumps and a large quantity of 75,000-volt paper-covered and lead-covered cable. There has been a good demand for poles, pole-line hardware, insulators and current transformers. Jobbers report continued good business.

Activities of the Trade

Crocker-Wheeler Directors Elect Officers of Company

At the first meeting of the new board of directors of the Crocker-Wheeler Electric Manufacturing Company, held this week, the following officers were elected for the ensuing year: Edmund Lang, president; Arthur L. Doremus, vice-president; Herbert C. Petty, vice-president and secretary; Theodore S. Fuller, treasurer; George W. Bower, assistant treasurer, and Edward C. Jones, assistant secretary. All the officers of the company remain the same except that Mr. Petty has been made vice-president in addition to his duties as secretary of the company and Mr. Jones has been newly appointed as assistant secretary. The executive committee will consist of Edward W. Brown, Ernest B. Humpstone, Frank H. Jones, Michael I. Pupin and Edmund Lang.

At the annual meeting of the stockholders of the company, held on May 12, three new directors were elected and this announcement was made in the May 15 issue of the ELECTRICAL WORLD. The only member of the new board who is thus an officer of the company is Edmund Lang, the president. This new directorate has been arranged to give the company the benefit of outside council in addition to the officers. The three new directors who were elected—Stewart S. Hathaway, Leonard S. Horner and William D. Sargent—have been stockholders of the company for some time and have been especially interested in its activities. All three men are familiar with broad business and manufacturng operations.

Railway & Industrial Engineering to Expand Plant Facilities

The Railway & Industrial Engineering Company, Greensburg, Pa., manufacturer of transmission, switching and protective equipment, has recently purchased the property and building of the Penn Aluminum Company, an adjoining plant, with two acres of ground, 15,000 sq.ft. of floor space and 200 ft. of railroad siding. The company will remodel and expand the brick building for additional storage space and extend the railway siding to its present plant.

The company has recently appointed E. C. Minteer as salesman to cover Wisconsin and Minnesota. For the last five years Mr. Minteer was in the sales department of the Public Service Company of Northern Illinois. Another appointment made by the company has been that of N. F. Harrington, who has been made district sales manager in New York City. Mr. Harrington was formerly porcelain specialist with the

Westinghouse Electric & Manufacturing Company and prior to that was a member of the sales organization of the Pittsburgh Transformer Company.

Stone & Webster Announce New Engineering Work

Stone & Webster, Inc., Boston, have been authorized to double the transmission facilities from the Dupont Circle substation of the Edison Electric Illuminating Company of Brockton at Brockton, Mass., to the lines of the Montaup Electric Company. The line will be about 14 miles long and will operate at 66 kv. A 7,500-kva. synchronous condenser will also be installed in an extension to the present switch house. The Savannah Electric & Power Company, which is now controlled by the Engineers' Public Service Company, has also commissioned the company to proceed with the design and construction of an extension to the Riverside power station at Savannah, Ga. This will consist of the installation of a 15,000-kw. turbo-generator, a 27,000-sq.ft. condenser and auxiliaries and two boilers having a capacity of 1,370 hp. each, with water-cooled walls. The turbine and boiler room will be extended and provision made for the use of pulverized coal under the two new boilers.

The Pittsburgh Reflector Company, Bowman Building, Third Avenue and Ross Street, Pittsburgh, announces the Pittsburgh glass "Color-Lite" made of heat-resisting glass.

The A. J. Lindemann & Hoverson Company, Cleveland Avenue, Milwaukee, announces that it has placed on the market a new L. & H. Electric toaster known as the No. 204.

The Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago, announces the opening of a new and larger office at 140 Cedar Street, New York City, in charge of W. S. Nichols, assisted by P. H. Butler and A. R. Berger.

The United Electric Company, Canton, Ohio, has placed on the market a new "Tuec" portable cleaner, designed to meet the cleaning requirements of buildings already built but not piped.

The Seyler Manufacturing Company, Pittsburgh, manufacturer of pole-line and high-tension hardware, announces that it now has under construction a large addition to its plant which will add about 40 per cent to its present capacity. This is the fourth large unit added in the last four years.

The McGill Manufacturing Company, Valparaiso, Ind., has placed on the market a small series-multiple switch known as the "Levolier Twi-Lite" switch, suitable for installing in shallow canopies, portable bases, chandelier bodies, etc., for controlling the lights.

The Clements Manufacturing Company, 601 Fulton Street, Chicago, announces that it has placed on the market the ball-bearing "Cadillac" auto vacuum cleaner, especially designed for cleaning automobiles.

Manning, Bowman & Company, Meriden, Conn., are offering a separate line of the most popular of the small home appliances in lower-priced merchandise. These units are said to be the equal in performance of the company's standard line but without the refinements of design that compel a higher price. A new company has recently been organized under the same name and will purchase the business of the former Manning, Bowman & Company. Stock of the new company was offered for sale last week.

The General Electric Company announces that among the recent new industrial control devices being marketed are a resistor terminal, an external relay reset, a relay installing wrench and a new relay mounting panel. With the exception of the resistor terminal, the new equipment is designed to facilitate the use of temperature overload relays.

The Ohio Brass Company, Mansfield, Ohio, manufacturer of high-tension porcelain insulators, electric railway equipment, etc., announces that its Chicago office has been moved from 1217 to 1714 Fisher Building, 343 South Dearborn Street.

The Westinghouse Electric & Manufacturing Company has recently received a contract from the San Antonio Public Service Company for supervisory control covering the complete control and supervision of seven distribution substations. The company has also recently received an order from the Chicago Surface Lines for a 4,000-kw., 600-volt direct-current automatically controlled substation and a set of supervisory control equipment.

The Roach-Appleton Manufacturing Company, 3440 North Kimball Avenue, Chicago, manufacturer of switch boxes, ground clamps, etc., announces that it has moved its New York office and warehouse to 45 Murray Street to obtain additional space and better facilities.

The National Lamp Works of the General Electric Company, Nela Park, Cleveland, announces that the Mississippi Valley Lamp Division of the company has moved its offices from the Central National Bank Building to the Landreth Building, 320 North Fourth Street, St. Louis.

The Circle F Manufacturing Company, Trenton, N. J., manufacturer of electrical and porcelain specialties, announces that the Hilday Company, General Motors Building, Detroit, will in the future represent the company in Michigan. Stanley H. Woleben, the former representative of the company, has retired from the manufacturers' agency business.

The Jefferson Electric Manufacturing Company, 501 South Green Street, Chicago, announces a new bell-ringing and signal transformer which is attached to an outlet box cover and is known as the "Nucode."

The American Engineering Company, Philadelphia, manufacturer of "Taylor" stokers, "Lo-Hed" electric hoists, etc., announces that H. Kempner, for the last three years in charge of sales promotion work of the company, has been appointed sales manager of its "Lo-Hed" electric hoist division.

Frank Hodson, 1015 Chestnut Street, Philadelphia, consulting engineer and formerly founder and president of the Electric Furnace Construction Company, Philadelphia, announces that he has signed contracts with F. T. Kaelin of Montreal for the exclusive rights to Mr. Kaelin's system, process and patents on the Kaelin electric steam boiler for the United States and South America. The capacity of the total number of Kaelin electric steam generators now installed is said to be more than 500,000 kw.

The American Electrical Works, Phillipsdale, R. I., manufacturer of bare and insulated wires has moved its Chicago office from 112 West Adams Street, where it has been situated for the past twenty years, to the new Masonic Temple Building, 32 West Randolph Street.

The Edison Lamp Works of the General Electric Company, has completed plans for the construction of a three-story addition to its works on Cross Street, Harrison, N. J., 70 ft. x 82 ft.

The Steel City Electric Company, 1207 Columbus Avenue, Pittsburgh, manufacturer of outlet boxes, switch boxes, etc., has taken out a permit for the construction of a new addition to its plant at Columbus Avenue and Sedgwick Street.

The Asbestos Shingle, Slate & Sheathing Company, Ambler, Pa., announces that it is again enlarging its facilities for the manufacture of "Ambler" ebonized asbestos lumber, which is used as a material for switchboards, instrument panels and similar purposes. The company states that this is the second time within a year that it has become necessary to devote increased space to the manufacture of this material.

The Bridgeport Brass Company, Bridgeport, Conn. announces that Charles H. Clark has been appointed raw-material salesman and will represent the company in Massachusetts and the cities of Providence, R. I., and Meriden, Conn.

Porter & Ross, Inc., 30 Church Street, New York City, manufacturers' agents, announce that they are offering the "Aurand, Jr." model J commutator slotter for ordinary duty on commutators of all sizes.

The Lindley-Dunning Manufacturing Company, 5120 Wakefield Street, Germantown, Philadelphia, has recently been incorporated under the Pennsylvania state laws to manufacture pumps and equipment for electric refrigeration. Elmer G. Dunning formerly vice-president and general manager of the Dunning Compressor Company, Holmesburg, Philadelphia, has given up all active duties in that company and is now affiliated with Lindley-Dunning.

The Ericson Manufacturing Company, 1987 East 105th Street, Cleveland, has placed on the market a line of "C & E" safety handles made of high-grade rubber. These handles are said not only to reinforce the connection between the portable cord and the plug or socket and protect the cord from wear but also to safeguard the users.

J. Barraja-Frauenfelder & Company, 8 Bridge Street, New York, engineer, announces a consulting and advisory service on oil engines and their application to the industry. The advisory staff includes Rear Admiral Charles W. Dyson, U. S. N., and W. V. Naulty, financial adviser. The executive staff consists of J. Barraja-Frauenfelder, executive engineer; Heinrich Schneider,

Edward C. Magdeburger and H. H. Wilkinson, associate engineers, and Roger A. McShea, associate on finance.

The Uehling Instrument Company, Paterson, N. J., manufacturer of CO_2 recorders and other power-plant instruments, announces that Henry Eggelhof, P. O. box 945, Dallas, Tex., has been recently appointed exclusive representative for the eastern half of Texas.

The H. C. Roberts Electric Supply Company, Syracuse, N. Y., has purchased the wholesale electric supply house of the Porter Electric Company, 510 Charlotte Street, Utica, N. Y. The store will continue as the Porter Electric Company and will remain under the management of Mr. Porter.

The Tork Company, Inc., New York, manufacturers of Tork clocks and lights, announces the removal of its offices to 12 East Forty-first Street. The company's offices occupy the entire fourteenth floor.

The Packard Electric Company, Warren, Ohio, manufacturer of transformers and automotive cables, announces that Harris & Butler, manufacturers' agents, with offices in the Real Estate Trust Building, Philadelphia, have been appointed district managers for the Philadelphia territory for Packard transformers.

The Square D Company, Detroit, is now offering its convertible power panels for use on three-phase, four-wire systems. This type of panel has the fourth wire, a neutral, arranged along the side of the cabinet.

The Standard Steel & Bearings, Inc., Plainville, Conn., announces that it has added "M-R-C" thrust bearings to its line of "SRB" annular ball bearings.

The Timken Roller Bearing Company, Canton, Ohio, announces that its branch office at 1033 Cathedral Street, Baltimore, was closed on May 1. The service requirements of the company's customers in that territory will hereafter be supplied through the Richmond, Pittsburgh and Philadelphia branches.

The General Electric Company has plans under way for the construction of new buildings at its Fort Wayne (Ind.) plant, including a medical and industrial service structure and recreation building for employees.

The Westinghouse Electric & Manufacturing Company announces that J. McA. Duncan, for fourteen years Pittsburgh district manager, has been promoted to be assistant general sales manager of the company. W. R. Marshall, formerly branch manager of the Buffalo office, has been selected to assume the duties of Pittsburgh district manager. H. F. Boe, formerly industrial division manager at Buffalo, has been promoted to branch manager of that office, and R. L. Kimber to industrial division manager. W. F. Barnes has also been appointed branch manager of the Tulsa office.

The Lapp Insulator Company, Inc., Le Roy, N. Y., announces the appointment of Harris & Butler, Real Estate Trust Building, Philadelphia, as district managers for the sale of Lapp products. The territory covered will consist of eastern Pennsylvania, southern New Jersey, Delaware, Virginia and the District of Columbia.

The Signal Engineering & Manufacturing Company, New York, manufacturer of bells, relays, fire-alarm-systems, etc., announces a change in address from 533 Canal Street to new quarters at 154 West Fourteenth Street.

The Fullman Manufacturing Company, 1209 Jefferson Street, Latrobe, Pa., manufacturer of "Latrobe" floor boxes and "Gem" insulator clamps, announces the appointment of Norman F. Grier, 1712 South Michigan Avenue, Chicago, as its district sales representative for Illinois, Iowa, Minnesota and Wisconsin; Walker Calderwood, 1444 Park Place, Detroit, as its district sales representative for Michigan, and S. G. Cummings, 516 Packard Building, Philadelphia, as its district sales representative for eastern Pennsylvania, southern New Jersey, Delaware, Maryland, Virginia and the District of Columbia.

The Arrow Electric Company, Hartford, Conn., has placed on the market a heavy-duty flush receptacle having a capacity of 40 amp. at 250 volts. The company is also offering a high-capacity switch of the flush type for the individual control of space heaters and heavy duty appliances. Both these devices are especially intended for domestic application to simplify the merchandising of electric ranges and other heavy-duty appliances.

The American Circular Loom Company, 90 West Street, New York City, manufacturer of "Xduct" and "Electroduct" rigid steel conduits and "Loomflex" non-metallic flexible conduit, announces that S. G. Cummings, 516 Packard Building, Philadelphia, has been appointed its agent throughout eastern Pennsylvania, the southern half of New Jersey, Delaware, Maryland and the District of Columbia.

The Continental Electric Company, Inc., 325 Ferry Street, Newark, N. J., manufacturer of motors, generators, grinding machines, etc., announces that William J. Ahern, formerly manager of industrial sales for the Electro Dynamic Company, Bayonne, N. J., has been appointed sales manager in charge of the New York City territory with offices at 140 Liberty Street, New York.

New Equipment Available

Portable Volt-Ammeters

The type DS-2 portable volt-ammeter has been designed by the General Electric Company to meet the demands for a compact and accurate direct-current instrument that is suitable for general testing purposes. The instrument, which can be carried in the coat pocket, has all its exposed parts protected by a hinged cover. The case is of bakelite molded to resemble leather. Six scales are incorporated in each of the meters, three for voltages and three for current. One of each reads direct and the others in multiples of 10 or 2. The scale length is about 3 in., normally marked in 75 divisions. The change from scale to scale and from voltmeter to ammeter is made by a rotating switch between the binding posts. Voltages up to 150 volts and currents up to 30 amp. can be checked with this instrument.

Electric Hoist

An electric hoist for use with limited headroom has been placed on the market by the Northern Engineering Works, 210 Chene Street, Detroit. It is available in capacities from 1 ton to 4 tons, inclusive, but will also be built in capacities up to 8 tons. The standard hook lift is 20 ft. and the clearance is 17 in. The gears and pinions are entirely inclosed and operated in a bath of lubricant. Upper and lower safety limit stops are provided, and Timken roller bearings are used throughout. The hoist can be furnished with gears or plain I-beam trolley, or without trolley for stationary mounting.

Radio Interference Fault Locater

To enable electric light and power companies to determine the location of radio interference sources, the Lundin Electric & Machine Company, Boston, is placing on the market a portable equipment, including a four-tube combination radio and audio instrument, loop, rod antenna, sector-type exploring coil and head telephones, easily operated from within a small motor car. The apparatus is built without regard to its qualities as a radio broadcast receiver and is not intended to be used to check up the functioning of radio sets or to locate atmospheric noises. The equipment affords a means of positively locating whether a certain interfering noise comes from a power, railway or communication system. It is said that the disturbance, if emanating from any of these, can be traced to its exact location provided the noise originates in any one spot on these systems.

Branch Circuit Attachment. — The "Noark" branch circuit attachment for use with standardized meter-service switches has been placed on the market by the Johns-Pratt Company, Hartford, Conn. It consists of a specially designed fuse block inclosed in a metal cabinet with hinged cover, permitting ready access to the fuses, while a dead-front protecting plate conceals all wiring and prevents contact with live parts.

Control Panel for Two-Speed Motors. —A new control panel, for use with two-speed motors driving baking machinery and machine tools, has been designed by the General Electric Company and bears the designation CR-7107-H-1. This device consists of two contactors mounted back to back, with interlocking arrangements. A temperature overload relay is connected to each contactor, thus giving overload protection to the motor at either speed. A special push-button station, for use with the new panel on baking service, has "mushroom" heads on each pushbutton. This construction prevents the dough on the operator's fingers from getting into the station, which sometimes causes the circuit to ground and give the operator a shock.

New Trade Literature

OIL CIRCUIT BREAKERS.—"Application of Oil Circuit Breakers" is the title of special publication No. 1643-A issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which describes the general application of oil circuit breakers, the determination of short-circuit current and the precautions necessary. A number of pages are devoted to tables and charts, and several illustrations are included.

CONDULETS.—The Crouse-Hinds Company, Syracuse, N. Y., is distributing bulletins No. 2,075 and No. 2,089, covering its new type "F" service entrance condulet and its condulet for grounding service wire and conduit system respectively.

ELECTRIC ARC WELDERS.—Bulletin No. 133 issued by the Burke Electric Company, Erie, Pa., describes the Burke variable voltage arc welder and its constant-potential arc welders. The advantages of the Burke variable welder are discussed, and illustrations of the various sizes and types are included.

SPECIFICATIONS. — The Copperweld Steel Company, Braddock Post Office, Rankin, Pa., is distributing a leaflet containing standard specifications for the manufacture, test, purchase and inspection of Aristos "Copperweld" non-rusting guy and messenger strand.

BRAKES. — The Clark Controller Company, Cleveland, has published bulletin No. 102, in which it describes the Clark "Three C" brakes. Illustrations are given showing the details of construction of the brakes, and tables giving approximate dimensions, ratings, weights, prices, etc., are included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Munich, Germany (No. 20,286), for electric refrigerators.

Purchase is desired in Torreon, Mexico (No. 20,344), of telephone switchboards, instruments, cables, wire, and other material for telephone system.

Purchase is desired in Dieppe, France (No. 20,340), for Diesel or semi-Diesel marine engines.

Purchase is desired in Cairo, Egypt (No. 20,319), of electrotherapeutic apparatus.

Purchase is desired in Belfast, Ireland (No. 20,468), of steam mold vulcanizing sections and electric tread repairers.

An agency is desired in Paris, France (No. 20,464), for dishwashing machines, boiler accessories, etc.

Purchase or agency is desired in Manchester, England (No. 20,420), for electrical appliances, including irons, radiators and vacuum cleaners, radio sets and parts.

An agency is desired in London, England (No. 20,423), for electrical novelties, radio sets and parts.

An agency is desired in Vienna, Austria (No. 20,421), for electrical resistance furnaces.

Purchase is desired in China (No. 20,419) of a 500-hp. coal-burning electric generating plant.

Purchase and agency is desired in Bucharest, Rumania (No. 20,422), for radio sets and parts.

An agency is desired in Monterey, Mexico (No. 20,424), for electrically operated refrigerating plants.

An agency is desired in Leipzig, Germany (No. 20,387), for precision-instrument manufacturing machinery.

Purchase and agency is desired in Lisbon, Portugal (No. 20,460), for portable refrigerating machinery.

TRANSFORMERS AND SPARES FOR MELBOURNE, AUSTRALIA. — Specifications have been issued by the State Electricity Commission of Victoria, Melbourne, Australia, on 22,000-volt transformers and spares, for which bids will be received until June 28. Copies of these specifications will be on sale, when received at the New York district office, 734 Custom House, and the Chicago district office, 76 West Monroe Street, of the Bureau of Foreign and Domestic Commerce.

POWER TRANSFORMERS FOR SYDNEY, AUSTRALIA. — A single copy of specifications issued by the city of Sydney, Australia, inviting bids until July 12 on single-phase oil-cooled power transformers, has been received by the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Washington, D. C. The specifications will be lent to interested American firms in the order in which requests are received. Reference should be to Exhibit-Australia-204,750.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

WEST BUXTON, ME. — Contract has been awarded by the Cumberland County Power & Light Company, Portland, for the construction of a new local power house, to cost about $500,000.

BOSTON, MASS.—The Quincy Market & Cold Storage Warehouse Company, 178 Atlantic Avenue, plans to build a power plant at its T-wharf properties.

CHICOPEE, MASS.—The construction of a new building, to include offices, garage, meter room and storage space, is under consideration by the Municipal Electric Light Department.

SPRINGFIELD, MASS.—Plans are under way by the Sixteen Acres City League for the installation of an improved lighting system in the section known as Sixteen Acres.

Middle Atlantic States

ALBANY, N. Y.—Work will begin at once by the Adirondack Power & Light Company on the erection of a 110,000-volt transmission line from Rotterdam to North Albany.

ELMIRA, N. Y.—The Willys-Overland Company, Toledo, Ohio, plans to install electric power equipment in the proposed extension to its local automobile plant, to cost about $1,000,000.

GOVERNORS ISLAND, N. Y.—Bids will be received by the United States Signal Corps, Procurement District, Governors Island, until June 2, for amplifiers, condensers and transformers (Cir. 49—postponed from May 19).

LYONS FALLS, N. Y. — The Gould Paper Company plans to install electric power equipment in connection with the rebuilding of its local newsprint mill, recently destroyed by fire, with loss of about $600,000.

MIDDLETOWN, N. Y. — Contract has been awarded by the Catskill Power Corporation for the construction of a large dam in the Mongaup Valley for the purpose of supplying power to the Orange County Public Service Corporation and other concerns with power.

MOUNT MORRIS, N. Y.—A bill has been signed by Governor Smith granting the Mount Morris Water Power Company permission to build a power dam in the Genesee River near Mount Morris. The plans provide for an ultimate development of 60,000 hp. which will be transmitted to Rochester. The cost of the entire project is estimated at about $10,000,000.

NEW YORK, N. Y.—A. Kimball & Company, 307 West Broadway, plan to install electric power equipment in their proposed factory at 3-7 Wooster Street, to cost about $350,000.

NEW YORK, N. Y.—A permit has been granted to the New York Edison Company to erect a substation, at 118 West Fifty-third Street, to cost about $75,000. William Whitehill, 709 Sixth Avenue, is architect.

PITTSFORD, N. Y.—Bids, it is understood, will be asked by the Sisters of St. Joseph, care of J. Flynn, architect, 217 East Avenue, Rochester, for construction of power house and boiler room, to cost about $750,000.

RAY BROOK, N. Y. — Plans are being prepared by the State Architect for the State Hospital Commission, Capitol, Albany, for a power plant at the New York State Hospital for the Treatment of Incipient Pulmonary Tuberculosis at Raybrook, to cost about $200,000.

WELLSVILLE, N. Y.—Application has been made by the Niagara Falls, Lockport & Ontario Power Company, Buffalo, for approval of a franchise in the village and town of Wellsville. The company plans to supply electricity to the municipal electric plant in Wellsville.

HIGH BRIDGE, N. J.—The New Jersey Power & Light Company, Dover, which has acquired the properties of the Hunterdon Electric & Power Company and the Jersey Electric Company, plans extensions to its transmission lines in this district.

SOUTH AMBOY, N. J.—The City Council is considering the installation of an improved fire-alarm system.

TRENTON, N. J.—The construction of an electrical building at Pauls Grove, to cost about $60,000, is under consideration by the Public Service Corporation.

PHILADELPHIA, PA. — The Reading Railway, Reading Terminal, and the Baltimore & Ohio Railroad, Twenty-fourth and Chestnut Streets, plan to install electric power equipment in their joint produce freight terminal at Delaware and Weccaco Avenues, to cost about $4,000,000.

PHILADELPHIA, PA.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., for changes in conduits and wiring in the United States mint at Philadelphia. For details see Searchlight Section.

RED LION, PA. — The Arbor-Winterstown Electric Light Company, recently organized, is considering extensions in transmission lines. The company purchases power from the Edison Power & Light Company, York.

BASSETTS, VA.—Plans for the proposed factory building to be erected by the Ramsey Furniture Company, at a cost of $215,000, include a power plant.

LURAY, VA.—Plans are under way by interests identified with the Page Power Company for the construction of a dam across the Shenandoah River, 4 miles west of Luray, to cost about $150,000. About 1,400 hp. will be developed.

YORKTOWN, VA.—The Virginia Electric & Power Company, Richmond, contemplates the erection of a transmission line to Williamsburg, via. Cornwallis.

BELLEVUE, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until May 25, for six motor generators for the local navy yard (Schedule 5428).

WASHINGTON, D. C.—Bids will be received by the Purchasing Agent, Post Office Department, Washington, until May 26, for 3,000 ft. electric cable.

WASHINGTON, D. C.—Bids will be received at the Navy Department, Washington, D. C., until July 7 for constructing by contract main motors, generators and control equipment for submarines V-5 and V-6.

WASHINGTON, D. C.—Bids will be received by the Board of Commissioners, District of Columbia, Washington, until June 7, for 10,132 ft. of signal cable for the electric department.

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, D. C., until May 26, for power units, brushes, brush holders, bearings, and armatures (Cir. C. P. 23000-D-1).

WASHINGTON, D. C.—An electrical department and laboratory will be installed in the McKinley manual training school to be erected by the Board of District Commissioners, District Building, at Second and T Streets, N. E., to cost about $2,000,000, for which bids are being asked on general contract until June 2. A. L. Harris, District Building, is architect.

North Central States

BALDWIN, MICH.—The Home Electric Company, Ludington, has applied for a franchise to extend its transmission lines in this section for light and power service.

BIG RAPIDS, MICH.—The City Council has approved the installation of an ornamental lighting system in the downtown section.

ELK RAPIDS, MICH. — The Michigan United Light & Power Company, Ludington, plans to erect a transmission line from Ludington to Elk Rapids, a distance of about 120 miles, to cost about $400,000.

FLINT, MICH. — The Chevrolet Motor Company, a division of the General Motors

Corporation, Detroit, plans to install electric power equipment in the proposed addition to its plant, to cost about $1,000,000.

ROCKFORD, MICH.—The local electric plant has been acquired by the Consumers Power Company, Jackson, which plans extensions in its transmission lines in this district.

TRAVERSE CITY, MICH. — The City Council is considering the installation of an ornamental lighting system in the business district.

CANTON, OHIO. — Bids will soon be asked by the Ohio Power Company for the construction of an equipment storage and repair building, etc., at Savannah Avenue and Second Street, to cost about $250,000.

CLEVELAND, OHIO.—A resolution has been passed by the City Council authorizing the installation of ornamental lamps on Carnegie Avenue, West Twenty-fifth Street, Madison Avenue and Clark Avenue. The cost is estimated at $100,000.

CLEVELAND, OHIO. — Separate bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until May 28 for furnishing "White Way" standards, and for subway type constant current regulators; also for an auto truck for the Division of Light and Power.

COLUMBUS, OHIO.—Plans are being prepared by the Columbus Railway, Power & Light Company for extensions and improvements to its system.

MASSILLON, OHIO.—Plans are under way by the Ohio Public Service Company, Cleveland, for the construction of an office building, to cost about $160,000, in Massillon.

ORWELL, OHIO.—The Cleveland (Ohio) Electric Illuminating Company, which has acquired the property of the East Ohio Power & Light Company, operating in East Orwell and Windsor, plans extensions in its transmission lines in this section.

WURTLAND, KY.—The Grasselli Chemical Company, Guardian Building, Cleveland, plans to install electric power equipment in its proposed local sulphuric acid plant, to cost about $600,000.

ATTICA, IND. — The Attica Electric Company, which has acquired the property of the Moran Electric Company, plans extensions in the transmission system to a number of rural districts throughout this section.

INDIANAPOLIS, IND.—Application has been filed by the Interstate Public Service Company with the Public Service Commission asking for authority to purchase the property of the French Lick & West Baden Water, Light, Heat & Power Company. The Interstate company, it is understood, plans to erect a transmission line to connect West Baden and French Lick with a large power plant at Edwardsport, and also to serve intermediate towns, including Bedford, Mitchell, Orleans, Paoli, Shoals and Loogootee with electricity.

BROOKPORT, ILL.—The municipal electric plant and distributing system has been purchased by the Central Illinois Public Service Company, Springfield, which plans to replace the present service with energy from its transmission lines.

CAIRO, ILL.—The installation of ornamental lamps on Commercial Avenue, from Second to Fourteenth Streets; on Second, Sixth and Eighth Streets, between Ohio and Washington Avenues, is under consideration. The plans call for ninety-seven iron standards mounted with 400-cp. lamps. The cost is estimated at $21,327. George F. Dewey is city engineer.

CHICAGO, ILL. — A permit has been granted the Commonwealth Edison Company to erect a substation, at 5549 Lowe Avenue, to cost about $20,000.

CHICAGO, ILL.—Contracts, it is understood, will soon be awarded for the second section of the Crawford Avenue power house of the Commonwealth Edison Company. The work will include a power house, including boiler and turbine rooms, transformer house, etc., to cost $2,000,000. Graham, Anderson, Probst & White, 80 East Jackson Boulevard, are architects.

MOUNDS, ILL.—Plans have been prepared by George F. Dewey, 613 Ohio Avenue, Cairo, engineer, for the installation of ornamental lamps in the business district, to cost about $8,000.

MUNCIE, ILL. — Authority has been given the Illinois Power & Light Corporation, 1547 Illinois Merchants Bank Building, Chicago, to purchase the local electric plant and the electric plant at Fithian. A transmission line will be erected to connect the two towns.

BRAINERD, MINN.—The City Council has authorized the installation of improved lamps at a number of street intersections throughout the city, to cost about $15,000.

FAIRMONT, MINN. — The Fairmont Canning Company has authorized the construction of a transmission line (3 miles long) for power service at its plant.

DES MOINES, IOWA.—Permission has been granted the Des Moines Electric Light Company to extend its transmission lines from University Avenue to Clive, and east of Des Moines, a distance of 6 miles, to serve rural districts.

NEW HAMPTON, IOWA. — The City Council has rejected a resolution providing for the sale of the municipal electric plant.

RED OAK, IOWA.—Permission has been given the Iowa Service Company, Lincoln, Neb., to reroute its lines connecting the Red Oak plant with the Malvern substation, which now is connected with the Lincoln.

JOPLIN, MO.—The erection of about 25 miles of 33,000-volt transmission lines in Newton and McDonald Counties is under consideration by the Empire District Electric Company.

KANSAS CITY, MO.—A permit has been granted the Missouri Hydro-Electric Company by the Federal Power Commission to build two power dams on the Current River, one at Hargus Eddy and the other above Van Buren. It is estimated that the dams will develop 21,000 hp.

MOBERLY, MO. — Extensions and improvements to its local plant, to cost about $30,000, are under consideration by the Missouri Power & Light Company, Mexico.

ST. LOUIS, MO.—Preliminary plans are being prepared by the Board of Public Service for the installation of additional units to the street-lighting system, to cost about $350,000. Concrete standards will be used.

ST. LOUIS, MO.—Bids will be received by the Board of Public Works, City Hall, until May 25 for foundation and substructure for power plant at Howards Bend Water Works plant on the Missouri River. The cost of the plant is estimated at $325,000.

FARGO, N. D. — Plans are being considered for the installation of an improved lighting system on a number of city streets. R. T. Jacobson, city engineer.

RUGBY, N. D. — The Rugby Light & Power Company plans to extend its transmission to Barton, a distance of about 27 miles. It also contemplates installing a 90-kva. or a larger oil engine-driven generating unit in its plant.

SIOUX FALLS, S. D.—Bids will be received by the Board of Commissioners of the City of Sioux Falls until May 25, for furnishing and erecting a 400-hp. oil engine, 270-kw. generator mounted on the engine shaft and a duplex acting power pump of 3,200 gallons capacity per minute against a head of 100 ft. Maury & Gordon, 1,445 Monadnock Block, Chicago, are consuting engineers.

GRAND ISLAND, NEB. — Extensions and improvements are contemplated by the Central Power Company this year involving an expenditure of $327,000.

SPENCER, NEB.—The Nebraska State Railway Commission has granted the Northern Nebraska Power Company, Deweese, permission to issue $670,000 in capital stock. The company proposes to build a hydro-electric plant on the Niobrara River, near Spencer, and to erect two transmission lines into adjacent territory, to serve electricity at wholesale to sixteen towns.

Southern States

BLUE RIDGE, GA.—Arrangements are being made by the Toccoa Power Company, a subsidiary of the Tennessee Electric Power Company, Chattanooga, for the construction of a large dam across the Toccoa River, near Blue Ridge. Most of the power developed will be transmitted across the state line into Tennessee. The ultimate cost of the project is estimated at $20,000,000.

DUBLIN, GA. — Plans are being considered by the Southern Pulp & Naval Stores Company, 42 Broadway, New York, for a power plant at its proposed local pulp mills. The cost of project is estimated at $500,000.

MARIETTA, GA.—Plans for rebuilding the chair factory of the Bramby Chair Company, recently destroyed by fire, with a loss of about $100,000, include a power plant.

SAVANNAH, GA.—The Savannah Electric & Power Company plans to build an addition to its plant on River and West Broad Streets, to cost about $250,000.

CARYVILLE, FLA.—The Brown-Florida Lumber Company is planning to build a power plant in connection with the rebuilding of its local mill, recently damaged by fire with loss of about $500,000.

JASPER, FLA. — The City Operating Company plans to rebuild the municipal electric power and waterworks station, recently destroyed by fire with loss of about $35,000.

ST. PETERSBURG, FLA.—The contract for the installation of an ornamental lighting system on Tangerine Avenue has been awarded to the Wright Electric Company. The cost is estimated at $57,000.

DUNLAP, TENN.—The Sequatchie Valley Power & Light Company has been granted a franchise to erect transmission lines in Dunlap.

PARIS, TENN.—Work will soon begin by the Kentucky-Tennessee Power Company, Bowling Green, Ky., on the erection of a high-tension transmission line from Paris to Gleason.

ENSLEY, ALA. — Surveys have been completed by the Birmingham (Ala.) Electric Company for the installation of ornamental lighting systems in Ensley and Fairfield.

LAKE CHARLES, LA.—Electric power equipment will be installed in the local rice milling plant to be erected by Alton Foster and R. E. Krause, of Lake Charles, and associates, to cost about $350,000.

HEALDTON, OKLA. — The Oklahoma Gas & Electric Company, Oklahoma City, has been granted a franchise to supply electricity in Healdton. A transmission line will be erected from Ardmore to serve Healdton, other communities and oil fields in this vicinity.

TULSA, OKLA.—Plans are being considered by the Producers Co-operative Company for the installation of a cold storage and refrigerating plant in its proposed market building, to cost about $135,000. Marshall C. Cross, Nebraska Building, is architect.

JACKSONVILLE, TEX.—The Southwestern Public Service Company, managed by Day & Zimmermann, Inc., 1600 Walnut Street, Philadelphia, contemplates the erection of a number of transmission lines that will connect a number of its properties in this section, including a line from Jacksonville to Rusk.

MILES, TEX.—The West Texas Utilities Company, Abilene, plans to build a local substation to cost about $35,000.

NACOGDOCHES, TEX. — The citizens have voted to sell the municipal electric plant to the Texas Power & Light Company, Dallas. Under the terms of the sale the company is to extend its transmission line from the new central power station, now under construction at Trinidad to Nacogdoches. The high-tension line, it is understood, will be extended from here to Lufkin.

Pacific and Mountain States

BENTON CITY, WASH.—The Pacific Power & Light Company, Seattle, plans to extend its transmission lines into the Benton Highlands district, a distance of about 5 miles.

PE ELL, WASH.—The City Council has granted the Puget Sound Power & Light Company a franchise in Pe Ell. Extensions and improvements will be made to the local system, to cost about $10,000.

PORT ANGELES, WASH.—Preliminary arrangements are being made by the Washington Pulp & Paper Company in connection with its proposed hydro-electric project on the Elwha River, about 4 miles from the city.

SEATTLE, WASH.—A permit has been granted the Puget Sound Power & Light Company authorizing it to store 140,000 acre feet of water in Lake Shannon for use in connection with the Baker River development. Construction costs are estimated at $100,000.

STANWOOD, WASH.—The Puget Sound Power & Light Company, Seattle, plans to extend its transmission lines on Carano Island, a distance of about 3 miles.

SULTAN, WASH.—The Sultan Electric Company has petitioned the Federal Power Commission for a preliminary permit for power development on Lake Isable and May Creek, across Snoqualmie, National Forest in Snohomish County, Washington.

TACOMA, WASH.—The Light Department of the City of Tacoma has entered into an agreement with the Peninsula Light Company, whereby the Light Department will finance the construction of a substation (to cost about $25,000) to supply electricity for the Gig Harbor district, to be distributed by the Peninsula company.

PORTLAND, ORE.—The City Council is considering a petition for the installation of ornamental lamps on Fifth Street from Burnside to Jefferson Streets.

BERKELEY, CAL.—The City Council is considering a petition for the installation of ornamental lamps on University Avenue, between Oxford Street and the waterfront, to cost about $75,000.

COLUSA, CAL.—Application has been made by the Glenn-Colusa Irrigation District, care of F. H. Tibbitts, Alaska Commercial Building, San Francisco, for permission to build a 12,900-hp. hydro-electric power plant on the Sacramento River in Glenn County, in connection with an irrigation project. The cost of the entire project is estimated at $2,000,000.

LOS ANGELES, CAL.—Plans have been prepared by the Hauser Packing Company for the construction of a cold storage and refrigerating plant to cost about $105,000. W. W. Ache, 1616 Fourth Avenue, is architect.

LOS ANGELES, CAL.—The Sperry Flour Company, San Francisco, plans to install electric power equipment at its proposed local mill at Maywood and Fruitland Avenues, to cost about $250,000.

LOS ANGELES, CAL.—The City Council has adopted an ordinance for the installation of ornamental lamps on Beverly Glen Boulevard, and Comstock Avenue, and on Loma Drive, using concrete standards, and on Acacia Street and Columbia Avenue, using pressed steel standards.

POMONA, CAL.—The City Council has authorized the installation of ornamental lamps on Huntington Boulevard, from Holt Avenue to Burdick Drive, maintained by underground wires.

SACRAMENTO, CAL.—Steps have been taken by the Chamber of Commerce of North Sacramento for the installation of ornamental lamps on the Del Paso Boulevard.

SAN DIEGO, CAL.—The City Council has authorized the erection of a transmission line in the Mission Valley section for power service.

RIFLE, COLO.—The Vanadium Corporation of Colorado, Electric Building, Grand Junction, plans to install electric power equipment in the proposed addition to its local mill, to cost about $200,000.

Canada

PAKUSKASING, ONT.—The Spruce Falls Power & Paper Company, recently organized to take over the property of the Spruce Falls Pulp & Paper Company, plans to build a 500-ton paper mill and sulphite and groundwood plants and a hydro-electric development at Kapuskasing and Smoky Falls.

SUDBURY, ONT.—Improvements are contemplated to the municipal electric lighting system, including the construction of a substation, to cost $15,000; electrical apparatus, $19,000; distribution lines, $13,000, and extension to street-lighting system, $5,000.

TIMMINS, ONT.—The Quinze Power Company, a subsidiary of the Northern Canada Power Company, has contracted with the Hornes Mines, the operating company of Noranda Mines, Ltd., to furnish power for the mines. The Quinze Company plans to extend its transmission lines into that district at once.

QUEBEC, QUE.—Surveys have been completed by the Shawinigan Water & Power Company for the proposed transmission lines to be erected between the Grande DeCharge and Quebec, a distance of about 200 miles. The proposed line will supply energy to local industries, through the Quebec Power Company.

ST. JEROME, QUE.—The Quebec Southern Power Corporation, 119 St. James Street, Montreal, which has acquired the municipal electric plant, plans to extend its service to municipalities in the surrounding district. It is proposed to increase the output of the local plant by 3,000 hp.

VERDUN, QUE.—Plans are under way by the Montreal (Que.) Tramways Company, for the construction of a substation in Verdun, to cost about $250,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 20, 1926)

1,581,729. ARC LAMP; H. Gerdien and A. Lotz, Berlin-Grunewald, Germany. App. filed Nov. 21, 1924. With the intrinsic brilliancy increased.

1,581,731. COLD EXHAUSTION OF INCANDESCENT ELECTRIC LAMPS AND THE LIKE; D. S. Gustin, Newark, N. J. App. filed Sept. 25, 1923.

1,581,754. ELECTRIC CURRENT INTERRUPTER; R. Mechau, Jena, Germany. App. filed Aug. 13, 1921. A base plate, a round metallic body rotatably disposed on the base plate, a plurality of pieces of insulating material disposed around the said body at about equal distances apart, a plurality of brushes fitted on the base plate and sliding on the said insulating pieces, and a magnet system so disposed in the vicinity of the metallic body that its lines of force intersect it.

1,581,781. LIGHTING-UNIT HOLDER; C. A. Bridges and A. K. Sutherland, Milwaukee, Wis. App. filed June 26, 1923.

1,581,785. ELECTRIC SWITCH; G. W. Cassidy, New York, N. Y. App. filed March 7, 1924. Ornamental; used with lighting fixtures.

1,581,787. REVERSIBLE INTEGRATING INSTRUMENT; Z. Ciffrinowitsch, Berlin, Germany. App. filed July 27, 1923. Integrating-type induction meters and relays, and in particular a compensating device to enable such instruments to function accurately for either direction of rotation.

1,581,828. ALTENATOR FIELD; S. R. Bergman, Nahant, Mass. App. filed Nov. 8, 1924. For high-speed turbo-alternators where the rotor is of relatively small diameter; to reduce the detrimental effect of armature reaction in such machines. The field of the machine is so designed that it is slightly unsymmetrical at no load and in such a direction as to improve the flux wave shape with increasing load.

1,581,830. CIRCUIT INTERRUPTER; A. Beschnitt, Berlin, Germany. App. filed May 14, 1923. Magnetically held closed and magnetically opened; will positively and quickly interrupt the controlled circuit in response to a predetermined condition, such, for instance, as an overload condition.

1,581,831. ALTERNATING-CURRENT SECONDARY NETWORKS; D. K. Blake, Schenectady, N. Y. App. filed Feb. 16, 1924. Wherein a source of power is arranged to be interconnected with a distribution network through a plurality of feeders; the provision of an improved means for controlling from a single point the connections at both ends of the feeders.

1,581,846. COMMUTATOR MOTOR WITH SWITCHING ARRANGEMENT FOR THE ROTOR WINDINGS; C. Lott, Zurich, Switzerland. App. filed March 11, 1926.

1,581,851. BATTERY CELL; M. I. Martus, Woodbury, Conn., and E. H. Becker, Waterbury, Conn. App. filed Feb. 13, 1925. A cell of the copper-oxide type with a liquid caustic alkali solution as electrolyte, and said cell further containing either or both silica or alumina in a reactive form.

1,581,868. ELECTRIC WELDING MACHINE; W. E. Reed, Pittsburgh, Pa. App. filed Dec. 28, 1923. Machines for welding crossed wires, rods or strips, as in the manufacture of welded fabrics for fencing and concrete reinforcement, or for other similar purposes.

1,581,872. ELECTRIC FURNACE; R. L. Rockwell, Seattle, Wash. App. filed May 26, 1924. Single-phase type; applicable to such furnaces using comparatively small currents at the higher arc voltages. Means whereby electric furnaces may be supplied with single-phase electrical energy derived jointly from the several phases of polyphase alternating-current systems.

1,581,876. DYNAMO-ELECTRIC MACHINE; H. W. Samson, Niskayuna, N. Y. App. filed Aug. 12, 1922. With improved frame and core construction so as to insure a more even distribution of the flux and thus remove the principal cause of shaft currents, which are largely due to the unequal distribution of the flux in the magnetic circuits as it flows in the clockwise and counterclockwise paths around the stator and rotor of such machines.

1,581,948. DIRECT-CURRENT VOLTAGE CONTROL OF CONVERTER SYSTEMS; H. M. Hobart, Schenectady, N. Y. App. filed April 4, 1922. To control the alternating-current voltage supplied to the converting apparatus, and thus the direct-current voltage, by varying the wattless current flowing through condensing apparatus connected in series in the alternating-current supply, or, when, as usual, the rectifying apparatus consumes a current with a fairly constant wattless component, by adjusting the capacity of a condenser of the synchronous type, connected in series in the alternating-current supply, by means of adjusting the field strength of the series-connected synchronous condenser.

1,581,949. SEGREGATED DRIVE FOR PAPER-MAKING MACHINES AND THE LIKE; E. H. Horstkotte, Schenectady, N. Y. App. filed Oct. 9, 1925. Wherein a plurality of units or sections of the machine must be driven at slightly different speeds, the speed relation thereof must be adjustable and the adjusted speed relation be automatically maintained.

1,581,957. FLOW METER; J. D. Keller, Pittsburgh, Pa. App. filed Aug. 2, 1922. Means for accurately measuring the rate of flow of fluids, gases or vapors and for visually or otherwise indicating accurately the rate of flow, whether steady or pulsating.

1,582,007. POWER-LIMITING AND INDICATING SYSTEM; W. S. Hamilton, Schenectady, N. Y. App. filed April 24, 1924. System for indicating and limiting the amount of power interchanged between power sources or transmission systems and power-distribution systems.

1,582,012. ELECTRIC BATTERY; F. A. Hugo, Edgewood Borough, Pa. App. filed Dec. 14, 1921. Storage or secondary batteries; method of assembling the parts of the battery at the points where the terminal posts project through the cell cover.

1,582,019. MOTOR-DYNAMO ELECTRICAL MACHINERY; A. M. Harrelson, St. Louis, Mo. App. filed April 1, 1921. With means for cooling it to maintain the temperature thereof, under operative conditions, sufficiently low to prevent damage to parts of the machine.

(Issued April 27, 1926)

16,336 (reissue). THERMALLY OPERABLE SELF-SOLDERING CIRCUIT BREAKER; R. H. Maple, Indianapolis, Ind. App. filed April 26, 1918. Of the fusible type; the provision in connection with a self-soldering circuit breaker, including contact blades and a latch, of a locking pinion and contact pinion support held normally in fixed relation with each other by fusible material.

1,582,043. METHOD OF AND APPARATUS FOR ELECTRIC WELDING; N. Hilberry, Steubenville, Ohio. App. filed Feb. 28, 1923. Welding of metallic parts wherein the parts are caused to engage while in a vaporized condition.

1,582,064. ELECTRIC SWITCH; W. J. Maddox, Jamestown, N. Y. App. filed June 19, 1925. Knife-blade switch especially adapted for use in telephone boxes or the like.

1,582,068. SWITCH; M. Morrissey, Kansas City, Mo. App. filed Sept. 17, 1923. Means whereby an iron can be heated to different degrees, whereby the low heating means are rendered active when the iron is placed in a vertical position upon its support, with means for automatically turning on full current when the iron is placed in a horizontal position.

1,582,070. RVAH-METER-TESTING SWITCH; T. J. Newman, Canton, Ohio. App. filed July 26, 1924. A test switch so constructed that the normal position of the switch allows the use of the auto-transformer and the testing position of the switch permits the meter potential to be placed the same as the kilowatt-hour meter by merely throwing the switch to test position, thus standardizing the testing of the RVAH (reactive-volt-ampere-hour) meter with the kilowatt-hour meter.

1,582,081. ARC WELDING; C. C. Peck, Cleveland, Ohio. App. filed June 2, 1922. Employing a special construction of positive electrode, no electromagnetic coil or equivalent means for producing a magnetic field being necessary in order to control the arc.

1,582,128. FURNACE-DOOR-HEATING MECHANISM; F. T. Cope, Salem, Ohio. App. filed March 5, 1925. Means for mounting an electric resistor upon the inner surface of the door of an electric furnace, whereby the door may be opened without interrupting the circuit to the resistors upon the furnace walls, and to provide means whereby the circuit to the resistor upon the door is automatically broken when the door is opened, to prevent overheating of the furnace plate at the end of the furnace and adjacent to the door.